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Media and Risk

A Phase Model Elucidating Media Attention to Nuclear Energy Risk

Silje Kristiansen



Silje Kristiansen

Media and Risk

A Phase Model Elucidating Media Attention to Nuclear Energy Risk

NEU - Nachhaltigkeits-, Energie- und Umweltkommunikation

Herausgegeben von

Prof. Jens Wolling (Technische Universität Ilmenau),
Prof. Heinz Bonfadelli (Universität Zürich),
Prof. Mike Schäfer (Universität Zürich) und
Prof. Oliver Quiring (Universität Mainz).

Band 5

Das Themenfeld Nachhaltigkeit, Energie und Umwelt stellt Gesellschaften weltweit vor Herausforderungen. Wie sich Umweltprobleme erfolgreich angehen lassen, wie Energiegewinnung und -nutzung bestmöglich realisiert und auf welche Weise diese Prozesse nachhaltig gestaltet werden können, wird von Akteuren aus Politik, Wirtschaft, Wissenschaft sowie Zivilgesellschaft kontrovers diskutiert. Welche Interessen sich dabei durchsetzen und wie Entscheidungen ausfallen, hängt wesentlich davon ab, wie diese Themen öffentlich kommuniziert werden. Daher ist die Erforschung dieser Kommunikationsprozesse – ihrer Entstehungsbedingungen, ihrer Ausgestaltung und ihrer Wirkung – von großer Bedeutung.

Die Reihe Nachhaltigkeits-, Energie- und Umweltkommunikation (NEU) bietet allen in diesem noch jungen Forschungsfeld arbeitenden Wissenschaftlerinnen und Wissenschaftlern eine Plattform zur Veröffentlichung ihrer Forschungsergebnisse. Sie bündelt einschlägige Arbeiten, erhöht so ihre Sichtbarkeit und ermöglicht einen intensivierte Austausch über ein zukunftssträchtiges Forschungsfeld.

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4. Tokyo by night, Lina Ingmarsdotter
5. Teddy bear in Pripyat, Ukraine, Lina Ingmarsdotter

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1. Introduction

On the afternoon of the 11th of March, 2011, Japan was struck by a seaquake. The “Tōhoku earthquake” that took place off the north east coast of Japan had the fourth highest magnitude of any earthquake measured since 1900. With a magnitude of 9.0 Mw this powerful quake triggered a Tsunami that hit the Japanese coast line from Aomori in the north to Chiba in the center of the country. This powerful wave destroyed acres of land, tearing away people and their houses. Over 25,000 people died or went missing in this disaster. This natural catastrophe is estimated to have caused damage amounting to 309 billion US dollars (Japanese Government, 2011, II-1; USGS, 2011, 2012). One of the areas in which the tsunami hit was the Fukushima prefecture. Close to the coast in Fukushima is a nuclear power plant with six reactors, four of which were damaged by the earthquake and flooded by the tsunami. This resulted in a series of escalating events, and in three of the reactors it ended with the worst case scenario possible in a nuclear power plant: a core meltdown (World Nuclear Association, 2015a). During the accident in the nuclear power plant, radioactive pollution was released and carried by the wind to districts northwest of the power plant contaminating a wide area and requiring the evacuation of over 100,000 people. It is still unclear when, or even if ever, the evacuated people will be able to return to their homes. The nuclear accident in Fukushima was rated as a seven on the INES-scale, giving it the highest possible value on this scale (World Nuclear Association, 2015a). This made it the most severe nuclear accident since the 26th of April 1986 when a nuclear catastrophe hit Chernobyl in the Ukraine. This puts Fukushima¹ among those accidents which, while they happen very seldom, cause huge damage when they do.

The compounding accident in Japan also triggered a huge news wave. The devastating damage caused by the natural catastrophe was depicted by the media all over the world. Soon the reports of the natural catastrophe were replaced by the galloping events in Fukushima’s nuclear power plant. The last severe nuclear accident had happened 25 years before Fukushima. At that time, Chernobyl was argued to have arisen because a highly complex technique was being used in a country that was not equipped to handle it (Luke, 1987). Now, when a similar accident struck the technologically highly developed country of Japan, it was an enormous shock, and shook many people’s faith in the security of the world’s 437 nuclear power plant units established in 31 countries (World Nuclear Association, 2015b). Even though Fukushima is geographically far from Europe, the European media paid great attention to the nuclear accident. Even though Switzerland was not directly affected by radioactive fallout from Fukushima, the accident was

¹ Hereafter the nuclear accident in Fukushima will be called only “Fukushima”.

brought right into Swiss living rooms. All stages of the catastrophe received intensive media coverage, and the nuclear accident set a ball in motion, which today, four years after the event, has not yet stopped. Fukushima triggered a political discussion of nuclear risk in the back yard not only of Switzerland but of other countries as well.

The probability of a nuclear accident of that dimension occurring is very low. But Fukushima reminded people that it can happen and can create high levels of destruction and disruption. Since nuclear power brings the highly valued benefit of relatively cheap, clean and reliable energy, 31 of the world's countries take the risk of using this technique (European Nuclear Society, 2015). In times of climate change, when keeping CO₂ emissions low is important, societies think twice before they shut down their nuclear power plants. In Switzerland, the decision to take this risk, which is ultimately a political decision, goes back to discussions around the technology in the fifties, which started shortly after nuclear bombs were dropped during the Second World War (Wildi, 2003, p. 11). The Swiss population "accepted a constitutional article on nuclear power in 1957" (Vogel-Misicka, 2011). That was before any major incidents struck the nuclear energy industry. This trend toward nuclear energy did not only take place in Switzerland, but world-wide, with the first nuclear power plant producing electricity for commercial use being commissioned in Russia in 1954 (European Nuclear Society, 2015). The first nuclear power plant in Switzerland was commissioned for commercial use in late 1969 and was the plant *Beznau I*, which today is the world's oldest nuclear power plant still in use. 1969 was not only the year in which *Beznau I* was commissioned, it was also the year in which one of the world's twenty largest nuclear accidents occurred. In January 1969 there was a nuclear accident in Switzerland rated as a five on the INES-scale. This happened in Lucens, a village in the south-western part of Switzerland, where an experimental reactor built inside a mountain got out of control, resulting in a partial core meltdown (ENSI, 2012; Wildi, 2003, pp. 251–252). This accident was, however, not given much attention by either the public or the media, and it did not affect the launch of the first nuclear power plant in Beznau later in the same year. Ten years later, in 1979, another accident, rated as a five on the INES-scale, occurred in the nuclear power plant on Three Mile Island in the USA, and this was followed by the severe Chernobyl accident in 1986. The Chernobyl accident happened during a period of protest in Switzerland against the use of nuclear energy, thereby giving support to an ongoing debate that had started in the seventies. The protesters were also protesting against a planned sixth Swiss nuclear power plant, which was to be built in Kaiseraugst. The building plans for Kaiseraugst were officially scrapped in 1989 due to the massive protests during the seventies and eighties (Kupper, 2003, p. 285). On into the nineties, Swiss citizens continued skeptical, and they voted for a ten-year moratorium on the construction of any new nuclear power plants. In 1998 the government committed itself

to shutting down the Swiss nuclear power plants after their planned 50 year life span. But, as climate change has become an increasingly pressing issue, a new intensity has been brought to the debate on nuclear energy. Even though a “nuclear renaissance” (Marshall, 2005) is not yet happening, the new CO₂ laws that confronted Switzerland in 2000 did create a new situation. Thus, later in 2000, a new energy law confirmed that nuclear energy was still an option. Some studies have suggested a “reframing” of nuclear energy as an environmentally friendly way of producing energy (Bickerstaff, Lorenzoni, Pidgeon, Poortinga, & Simmons, 2008; Doyle, 2011). In 2008, following these see-sawing changes, and nineteen years after the heavy protests and twenty-two years after Chernobyl, three nuclear power plant operators (BKW, Axpo and Atel [today Alpiq]) applied for permits to construct new nuclear power plants in Switzerland. In February 2011, 51.2 percent of the population of Bern voted in favor of these building plans at the nearby nuclear power plant of Mühleberg. It would seem that at this point in time, the Swiss population was willing to invest further in this technique, and to continue to take the risk by extending the planned life span of the existing power plants. According to the original plan, those would all have been shut down between 2019 and 2034 (Vogel-Misicka, 2011). However, in 2011, in the aftermath of Fukushima, everything changed once again.

After Fukushima, it was only three days before the Swiss “Energy Minister Doris Leuthard suspended the general licenses for the three planned nuclear power plants” (Keiser, 2014). Two months after that, on the 25th of May, 2011, the Swiss Federal Council decided to phase-out nuclear energy. Since then, there has been ongoing political discussion around nuclear energy production in Switzerland. Some events have prompted changes, like the decision of the nuclear operator BKW to decommission Mühleberg in 2019 (BKW, 2013). This decision was communicated in October 2013, four months before the population of Bern had another referendum, this time to decide whether or not Mühleberg should be shut down immediately. According to this referendum, 63 percent of the population was in favor of a longer life for the power plant rather than an immediate shut down. In its winter session of 2014, the Swiss parliament discussed its “Energy Strategy 2050”, which is an important first step toward a plan for managing energy requirements in Switzerland, including the future of the five nuclear power plants (Keiser, 2014). However, the last word, potentially from the Swiss population, determining the future of its national nuclear energy production, has yet to be spoken.

When looking at the political history of nuclear energy production in Switzerland, it becomes obvious that there have been times in which support for this technique has been stronger, and times when it has been weaker. Decisions on risks, such as those

accompanying nuclear power, are complex. The see-sawing in history reveals the extent to which the decision is influenced by external events as these bring reminders of the potential detriment. What makes this particular process of risk taking so complex is its combination of risk dimensions: An obvious and high benefit is combined with a low probability of damage, but with the potential to be severely detrimental. During those periods when no negative event occurs to draw attention to the negative aspects of the risk, the detrimental potential seems distant and highly improbable, which indeed it is. When a severe accident, such as the one in Fukushima, occurs the cards are obviously reshuffled, and the possibility of an accident in that range comes to be perceived differently, as being much higher (Schaub, 2011). The potential losses that could result from the use of nuclear energy are weighed in a new light against the high benefits it brings. An accident triggers attention and discourse at all levels of society.

An accident, *per se*, will trigger such discussion. However, most of us would not know about accidents happening so far away if it were not for the media reporting on those accidents. Since no radioactive fall-out affected Switzerland following Fukushima, Swiss citizens would not have known about the accident in far-away Japan if it were not for the media coverage. The mass media spreads knowledge of an event and is considered to contribute the most to the amplification of risk messages, transmitting them as it does to the global public (Pidgeon, Kasperson, & Slovic, 2003; Vasterman, Yzermans, & Dirkzwager, 2005, p. 513). Any such accident, with the detailed and specific media coverage it gets, both draws attention to the nuclear energy issue and prompts discussion around the event and what actions, if any, should be taken in order to deal with this risk in a country's own backyard. In most countries, there has been no radical rethinking of the nuclear energy production situation since Fukushima. However, in others, for example in Germany, Belgium and Switzerland, Fukushima triggered intense discussion and radical changes. The different reactions triggered in various countries by the Fukushima accident clearly reflect a range of factors, such as the specific nuclear energy history of that country, and, almost certainly, how the local media covered the event. Media coverage is known to have influencing power, and that is one reason this study wants to find out how the Swiss media report nuclear energy, if and how its coverage of nuclear energy changed after Fukushima, and how the media depicts risks, like those of nuclear energy?

As the history of the political discussion around nuclear energy in Switzerland shows, the perception of risk appears to change over time, and seems to reflect different phases.

It seems likely that the media coverage of risk, or risk communication², goes through similar fluctuations with the media coverage and the context in which it exists each influencing the other. As this study will discuss, the concept of risk has different dimensions, and thus the fluctuation and changes in media coverage may be connected to whichever risk dimension is emphasized at a specific moment in time. The two most obvious dimensions of risk are *benefit* and *detriment*. This study explicitly looks at risk as a two edged sword, with both a positive and a negative side. I therefore want to emphasize that when I speak about risk in this study both sides of this sword are implied. Thus, my interpretation of risk differs from the often perceived, every-day notion of risk being something purely negative.

Looking at the see-sawing changes in the history of nuclear energy in Switzerland, it becomes obvious that there have been phases during which the benefits have been more emphasized and other phases when the detrimental factors have been brought into focus. The benefits were possibly more in focus during the period before Fukushima happened. Swiss nuclear operators obviously assessed the situation as one in which they could propose their plans for building new nuclear power plants without being hopelessly outvoted. Furthermore, as the referendum in February, 2011 in Bern showed, it seems that the majority of the population was accepting of those plans. This generally observed state was most probably also represented by the media coverage of nuclear energy at that time. It is very likely that, together with the changes in political climate after Fukushima, the media coverage also changed. It is highly likely that, following the accident, the detrimental dimensions took center stage, both in people's minds as well as in the mass media coverage. Yet, the situation is probably not as black and white as it appears when only the benefits or the detrimental dimensions are given focus. The complexity of risk, and of this risk in particular, is due to the low probability of the detrimental dimensions occurring, but the severe damage that can be caused, which must be balanced against the potential benefits. It is reasonable to assume that the *probability* of an accident happening is an issue for discussion when deciding whether to take a particular risk. If something has a very low probability this will influence the risk decision. *Decision* is another important keyword when it comes to risk taking. Risk is, as even the linguistic use of the term shows, "taken". Risk is decided upon, and obviously this decision is influenced by the levels of perceived benefit and detriment, including the probability of detriment as well as the potential *severity* of that detriment. If all of these dimensions were easy to calculate, the decision might still have to be debated, but it would not be as complex as when:

² This study uses risk communication and risk coverage interchangeably, and, if nothing else is indicated, refers to the risk communication of mass media.

- something is so highly beneficial as nuclear energy, especially in times of CO₂ emission restrictions and climate change, and when considering the high costs and difficulties of restructuring energy production;
- At the same time it is known, as Fukushima reminded the world that it can potentially cause severe damage, although the probability is difficult to forecast and therefore allows the situation to hover in uncertainty.

These factors make risk taking³, and this particular risk at this particular moment in time, very complex. In the moment of making a decision, ideally, the decision-maker is informed regarding all dimensions of the risk. As most of us do not deal with nuclear energy production in our everyday lives, the mass media is an important informant regarding this risk. This makes the mass media's risk communication not only an interesting source for exploring how risk dimensions are covered, or might be covered, or are not covered at all, but it also makes risk communication a valuable instrument in the process of understanding risk taking in areas of complex risks such as the one involving nuclear energy production.

Many researchers before me have dealt with mass media risk communication, and the mass media communication of nuclear energy issues and nuclear accidents. However, no one of them has, to the best of my knowledge, investigated all dimensions of risk through the application of a broad understanding of risk in their empirical work. Also, many studies have focused on a short period after a damage has occurred and have analyzed accident coverage. However, this approach mostly focuses only on the detrimental dimensions and therefore only on one phase, which is probably not enough to capture risk communication in relation to all its aspects. Apparently, no one has analyzed risk communication per se, including all risk dimensions in the manner in which they will be discussed in this study where risk is not only interpreted detrimentally and also not as the contrast of only benefit versus "risk". Therefore, this study aims to close this research gap and to apply a broad understanding of risk and a phase model to risk communication. As it is assumed that different dimensions of risk will be focused on at different times, a phase model based on a multidimensional risk definition is expected to capture a risk coverage pattern changing over time. The argument that risk communication has more to it than accident coverage, which focuses purely on the detrimental dimensions, is easy to make as it is obvious that no one would take the risk of nuclear energy production if the only thing decision-makers knew about the technique was that it can cause severe damage. The benefits of nuclear energy are evidently an important aspect, which are part of the risk and which are clearly understood by the risk takers. Because risk has more to it than damage and accident coverage, this study aims to cap-

³ Risk taking implies the decision whether to take a risk or not.

ture mass media coverage of the whole range of risk dimensions. In doing this, the goal is to explore the “anatomy” (Rowe, 1975) of risk communication. This will be done by analyzing Swiss newspaper coverage of nuclear energy for 14 months before and four years after Fukushima, believing that within this time span all aspects important to risk taking in relation to nuclear energy production will have been the subject of discussion and media coverage.

By analyzing the risk dimensions in mass media risk communication and by applying a phase model, this study aims to contribute to a better understanding of how mass media deal with ambivalent issues like risks. Does risk communication follow a pattern, and can this pattern be used to draw an anatomy (Rowe, 1975) of risk communication? Anthony Downs (1972) analyzed environmental communication and discovered that environmental issues are discussed in different attention phases and cycles. This study derives important knowledge from Downs’ study as it relates to issue attention following phases, and applies it to risk communication. As Kitzinger and Reilly (1997, p. 319) state, media “are ill adapted for sustaining high level coverage of long-term threats.” “Even if ‘risk’ is inherently newsworthy, not all risks can be in the news all the time” (Kitzinger, Reilly 1997: 320). Because media attention cannot be given to all the risks society faces every day, it is reasonable to also assume that not all dimensions of risk will be given attention in all news features dealing with risk. News reports covering the benefits, the potential detriment, with its high or low probability, its potential severity, its predictability, and risk decisions do not seem likely to happen often. Instead, risk communication is predicted, most of the time, to be focused on just one, or a few, of these dimensions at a time. One aim of this study is to find out if this is the case, and whether risk dimensions form phase patterns over. Assuming that there is a phase pattern in risk coverage, and given that people are influenced by what they currently read or hear in the media, this would obviously make the timing of decision making quite crucial.

When looking further at which functions risk communication is said to have, the relevance of this study becomes clearer. Morgan et al. (2002, p. 4) see the function of risk communication as being “to supply lay people with the information they need to make informed independent judgements about risk to health, safety, and the environment.” In order to make independent judgments and decisions on risk, all risk dimensions should be known to the decision-maker. Renn (2010, pp. 177–178) additionally mentions that “the ultimate goal of risk communication is to assist stakeholders and the public at large in understanding the rationale of a risk-based (risk-informed) decision.” He also points out that a “balanced judgement” will ideally be made, and states that “good practices in risk communication are meant to help all affected parties to make informed decisions

about matters of concern to them.” As Switzerland is using nuclear energy, this is a matter of concern to the country, and risk communication needs to inform upon this. This leads to the question whether the Swiss mass media supplies “the (potentially) affected” with information on all aspects of risk, and whether it is equipping those recipients to make informed decisions. This question is even more tantalizing in a direct democracy like Switzerland where the citizens of the country can directly be the risk decision-makers. Upon what knowledge are voters in Switzerland choosing whether or not to engage in the risk of nuclear energy production? As Morgan et al. (2002, p. 4) point out, inadequate risk communication “creates an illusion of competence” and denies recipients “empowerment for dealing with the risk.” A risk whose potential detriment may heavily affect individual persons requires empowerment of the decision-maker to be legitimate. Therefore, this study aims to investigate from the perspective of communication science, and based on a broad understanding of risk, whether all risk dimensions are covered by the media, how they are presented, and whether phases defined by varying focus on these risk dimensions can be observed in the media coverage.

To answer these and additional questions, in chapter 4 this study will deal with the risk concept in greater depth, discussing different definitions used in the field and discussing the understanding of risk as applied in this study. In this context, risk communication will also be discussed, explaining how it is defined, and what the functions of this communication are (chapter 4.4). Following this essential part, the discussion will lead on to theoretical approaches which analyze the phase patterns of mass media communication. Such phases can be triggered by certain events, and given that attention to an issue often rises when a dramatic event occurs, this study will also look more closely at theoretical approaches that address the issue of changes in communication triggered by such events (chapter 5). After this theoretical overview, research studies analyzing media coverage of nuclear energy will be discussed in chapter 6. Based on this knowledge, and having identified research gaps, an innovative risk communication phase model will be introduced and the research questions and hypotheses for this study will be discussed in chapter 7. These questions and hypotheses will be operationalized in the following sections. The method section will, additionally, explain how the empirical analysis was conducted (chapter 8). After that, the results of the study will be presented (chapter 9), summarized (chapter 10) and discussed in chapter 11. Before entering into the discussion of risk, some additional background will be given on nuclear energy in general (chapter 2), and on the nuclear energy situation in Switzerland (chapter 3) to enable a better understanding of the context.

2. Nuclear Energy: Benefits and Detriments

In 31 countries, a total of 437 nuclear reactors (June 2015) produce energy by splitting atoms of either uranium or plutonium. The energy that is released during this reaction is used to produce steam, which drives turbines and thereby generates electricity (World Nuclear Association, 2015b, 2015c). The amount of electricity that is derived from nuclear power plants differs from country to country. In Switzerland, five reactors supply 40 percent of the country's electricity (BFE, 2013). In 2012, eleven percent of the world's electricity came from nuclear power plants (see Figure 1).

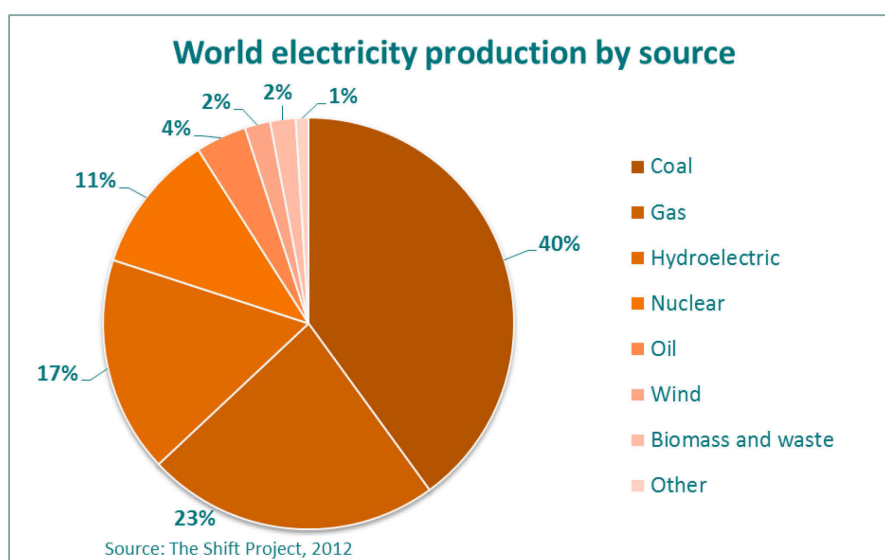


Figure 1 World Electricity Production in 2012⁴

This method of producing electricity has several benefits, but can also cause detriments; Table 1 shows an overview of some of these potential effects.

⁴ Source: The Shift Project (2012)

Table 1 Nuclear energy—benefits and detriments

Benefits	Technical	Stable electricity supply A proven technology Small volume, high energy content Productive use of uranium High security
	Economical	Cheap to operate Stable and predictable costs Long lifetime Low external costs Technical innovation
	Societal	Secure energy supply Cheap electricity price Independence from other countries
	Environmental	Low pollution emissions (CO ₂) Small land requirements Small fuel and waste volumes Wastes are managed
	Individual	Job creation
Detriments	Technical	Nuclear meltdown
	Economical	High costs from accidents High upfront costs Sensitive to interest rates Long lead times Long payback periods
	Societal	Nuclear weapons proliferation Terrorism Potential burden to future generations Unliveable areas Energy crises (from reactor fallout)
	Environmental	No solution to nuclear waste issue High toxicity (ionising radiation) Contaminated food, water and animals
	Individual	Physical and psychological health Evacuation Death

Note. Sources: (Ferguson, 2007; Rogner, 2008)

Some benefits and detriments may fit in more than one category. For example, evacuation could also be considered as a societal detriment.

This list is not exhaustive.

The main benefit of nuclear energy that first comes to one's mind is that it produces electricity, and in the current light of climate change, many people have learned that nuclear energy is relatively clean. However, as no one can have missed, severe accidents can also occur, like the one in Fukushima. This infrequently-occurring detriment has caused further detriments and problems. The relevant benefits and detriments are to be weighed against each other in order to decide whether to engage in that technique of nuclear energy or not. However, not all of those (some rather technical) benefits and

potential detriments will be equally familiar to the general public, as the mass media does not report on all of them. This study will shed light on which of those aspects are focused on by the media.

When the process of nuclear fission gets out of control, it can cause severe damage, pose a health threat to humans and animals, and damage the environment. However, such severe accidents are rare—but when they do occur, they raise much attention and sometimes trigger a reconsideration of the general issue of nuclear energy production. This chapter will discuss three of the largest and most well-known accidents, which have triggered a re-evaluation of the risk of nuclear power. The severity of a nuclear accident is evaluated by IAEA (International Atomic Energy Agency) and rated on the so called INES-scale (International Nuclear Event Scale), which rates nuclear incidents and accidents on a seven-point scale, see Figure 2.



Figure 2 International Nuclear Event Scale⁵

March 28, 1979, was the first widely-known accident in a nuclear power plant. This accident happened in the American plant on Three Mile Island in Harrisburg, PA. The accident is sometimes referred to as “Harrisburg” or “Three Mile Island”. It was quite severe and was given a rating of five on the seven-point INES-scale. Caused by human errors, a situation escalated which resulted in a partial core meltdown in one of the three reactors in the plant. It resulted in a release of radioactive gases; however, it seems that

⁵ Source: International Atomic Energy Agency (2015)

the effect this had on human health was close to non-existent. That same year, a clean-up started which finished in 1993 (The New York Times, 1993).

Only seven years later, on April 26, 1986, a much more severe nuclear accident at Chernobyl happened in the USSR, in what today is Ukraine. This accident resulted in an explosion and a fire in the nuclear reactor, and large amounts of radioactive fall-out were released and carried by the wind throughout large portions of Western Europe. The accident at Chernobyl was rated with a seven on the INES-scale, meaning this accident was the worst possible type of accident. There are contradicting numbers of how many people died in the accident and how many developed cancer afterwards. The fact is that large numbers of people living close to the plant had to be evacuated, and still today the nearby city of Pripyat is a ghost town. The state of the plant itself remains unstable, and one can read about how a new concrete construction to cover the plant is being planned and built (World Nuclear Association, 2014).

During the next 25 years following Chernobyl, no larger accidents have happened. This shows that the probability of a severe accident is low. But then trouble struck Japan. On the 11th of March 2011, triggered by a seaquake off the north-eastern coast of Japan, a huge tsunami flooded the nuclear power plant in Fukushima. Power supplies operating the cooling system of the power plant were affected and it was only a matter of time before it resulted in explosions and core meltdowns. This accident was also rated with a seven on the INES-scale. Over 100,000 people had to be evacuated and after the accident a long process of decontamination work started in the region (World Nuclear Association, 2015a). Affected people received instructions on how to decontaminate their gardens and houses. Vast amounts of contaminated material are being stored in large plastic bags throughout the region. Apparently, however, the Japanese government has not given up hope on returning people to their homes, as many are still living in provisory housing. This is a very costly enterprise that is critically evaluated by many Japanese citizens, as the money used to decontaminate could instead be used to give the affected people a new chance in a non-radioactive area.

Fukushima, as described in the introduction, was one of the three largest nuclear accidents ever, and it influenced many people and triggered a huge amount of media coverage. On March 12, 2011, the news media reported that the earthquake and tsunami had caused the cooling system to drop out and that areas were evacuated as a result, but that the situation was still unclear. Following this was a period of struggle, trying to cool the reactors to prevent the worst case scenario of a core meltdown and trying to handle the large amounts of contaminated water that originated from the cooling attempts. It was first on May 25, 2011, that the nuclear operator running the Fukushima power plant, Tepco, communicated and confirmed the speculations that had been going on for weeks:

there had been three core meltdowns in the plant a few days after the quake and tsunami. The information policy of Tepco, as well as the difficult situation in the power plant itself, resulted in a period of uncertainty and speculation. Not only did this provide many opportunities for nuclear opposition groups to activate and promote their agendas, but it also gave people a chance to discuss policies and re-evaluate the situation in Switzerland.

3. Nuclear Energy Context in Switzerland

In order to understand the situation that Switzerland was in regarding nuclear energy when the world was shaken by the Fukushima accident, this chapter will present a short overview on how nuclear energy has evolved in Switzerland.

Since the mid-1950s, Switzerland has been dealing with nuclear energy. For time line of important (Swiss) nuclear energy events, see Figure 3. In 1955, the physician Paul Scherrer from the Swiss Federal Institute of Technology in Zurich (ETH), together with the Brown Boveri AG and other companies, founded a company called Reaktor AG. In the village of Würenlingen in the canton Aargau, the first research reactor—called DIORIT—was commissioned in 1960. Also in the 1960s, construction started on an experimental reactor in the village Lucens in canton Waadt. There were several critical voices in these early days of nuclear energy that were against those purposes, but the response to these criticisms was that the building of an experimental reactor was important for Swiss industry. Only if Switzerland had their own experience with this technique could they as a country stay independent of foreign countries in this matter. The plan was to develop the reactor type used in Lucens to a stage of series-production readiness. This would enable Switzerland to be a part of the nuclear era. Because of these intentions large investments in personnel and financial levels were made by machinery companies. Even the Swiss Federal Council provided a generous subsidy credit in the amount of 50 million Swiss Francs (Wildi, 2003).

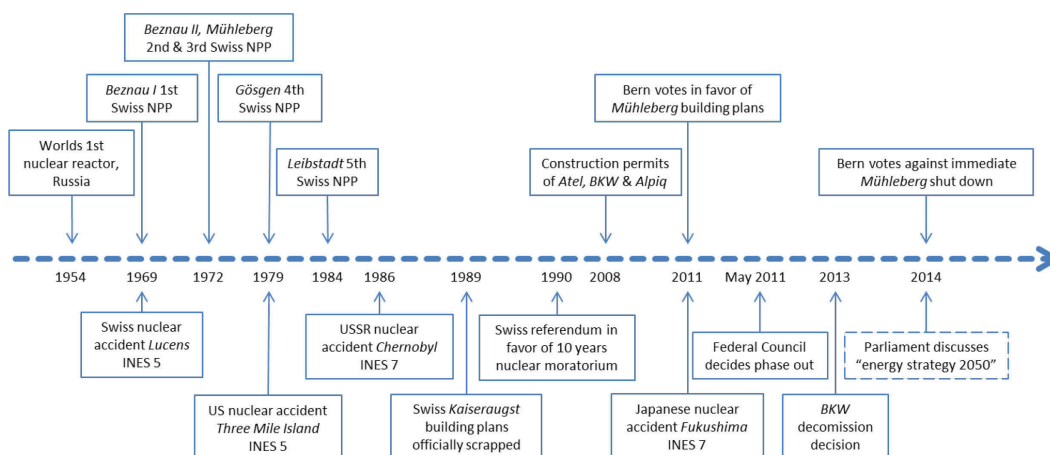


Figure 3 Time Line of Important (Swiss) Nuclear Energy Events⁶

⁶ Sources: Wildi (2003, pp. 251–252); Vogel-Misicka (2011); ENSI (2012); World Nuclear Association (2014); European Nuclear Society (2015). NPP = Nuclear power plant. The parliament discussion of the “energy strategy 2050” has a dashed boxed, because it is neither a positive nor a negative event.

The reactor in Lucens was built inside a mountain cavern. During the building phase there were some delays caused by technical problems and therefore the already-outdated reactor was finished in 1968. As the experimental reactor was commissioned on January 20, 1969, an accident occurred. The reactor got out of control and the situation escalated, resulting in a partial core meltdown. No humans were hurt in the accident, but the Swiss plan to develop its own reactor was brought to an end (Wildi, 2003). The accident was quite severe and was rated as a five on the INES scale (ENSI, 2012). Since no one was hurt and it did not release any radiation that put anyone in danger, the accident was not paid much attention, either by the people or by the media. Despite this accident, the first commercial nuclear reactor—called Beznau I—went online on the electric net in that same year, 1969. The reactor used in Beznau I is an American pressurised water reactor. Three years later, in 1972, the second and third reactors followed. The second was another reactor in Beznau and the third was in the village of Mühleberg. Both reactors in Beznau are pressurised water reactors, while the one in Mühleberg is a boiling water reactor.

Even though the Three Mile Island accident happened in 1979, that same year a third nuclear power plant was put into use in Gösgen. In 1984, the fifth and what turned out to be the last plant was commissioned in Leibstadt. The sixth planned plant in Kaiseraugst was faced with massive protests and was subsequently shelved in 1989 after years of struggles. In the following year, 1990, Swiss citizens voted in favor of a nuclear moratorium. This meant that no new nuclear power plants were allowed to be built until the year 2000. However, in 2007 a discussion over new nuclear power plants had a revival. If the existing ones were shut down as planned after fifty years of operation, this would mean that they would start to be shut down ca. 2019. In 2008, three nuclear power plant operators, *Atel* (now *Alpiq*), *BKW* and *Axpo*, submitted applications for new construction. These were discussed before the nuclear accident in Fukushima happened. In Bern in February 2011, a referendum was even held, which resulted in 51.2 percent of the population of Bern voting in favor of the building plans for the nearby nuclear power plant of Mühleberg (Vogel-Misicka, 2011). Three days after the accident at Fukushima, these new building plans were buried by the Swiss Energy Minister Doris Leuthard (Keiser, 2014). On May 25, 2011, the Federal Council decided not to build any new nuclear power plants in Switzerland, which meant a stepwise phasing out of nuclear energy. Later the same year, in June and September, this motion was accepted by both the National and State Councils. But this does not yet mean the discussion is over. The Swiss citizens have not yet had their say, and they might still have the possibility to do so. Since Fukushima, there has been an ongoing debate about nuclear energy production in Switzerland. There has been some movement on the question, as for example the nuclear operation *BKW* communicated in October 2013 that they will shut

down the Mühleberg plant in 2019. Interestingly, this decision was communicated four months before the citizens of Bern voted on another referendum, in which they were allowed to decide if the nearby nuclear power plant of Mühleberg should be shut down immediately or allowed to continue to run as long as it is considered safe. There was a decision in which 63 percent were in favor of letting safety be the deciding factor in the power plant's life span. When the Bernese had the opportunity to immediately shut down "their" power plant, they said no. In the winter session of 2014 a discussion followed in which the parliament discussed the so-called "energy strategy 2050". This strategy is the first step towards a plan of what the energy situation in Switzerland will look like in the future, including the fate of the five existing nuclear power plants (Keiser, 2014). The last word of the Swiss population has not yet been spoken—how do they want to handle the nuclear power plants after Fukushima? This is one aspect which makes this issue so interesting to study. Having learned about the nuclear energy context, this study will now introduce the key concept of this study, namely risk.

4. What is Risk?

The word “risk” is frequently used in everyday life, and there seem to be few problems in understanding it. But, as with many things, it becomes trickier when taking a closer look at it. The concept of risk is not only an every-day word, but it is also used across scientific disciplines and that is where its complexity becomes apparent. The concept of risk is defined differently in different fields of research, while even within fields definitions are multifaceted. Since risk is a core concept in this study, it is necessary to discuss different interpretations of risk. This chapter will take a look at some definitions of risk that focus on diverging aspects of the concept. The precise use of the term is important because different definitions of the concept will lead to slightly different research objects. When reading a work on risk communication, one should be aware of the fundamental definition of the term as used in that particular study. This chapter will discuss different definitions of risk with a focus on how the term is used in communication science. After presenting this overview, I derive a broad definition and understanding of risk, which is thereafter used in this study to identify and encompass risk communication and to make statements about it. Before investigating these different definitions, we will first take a brief look at some general perspectives on risk just to get a feeling for the contexts in which risk is the focus.

4.1. Perspectives on Risk

Before engaging with the field of risk research, this diverse field, which deals with risk from various perspectives, will be briefly outlined. On the one hand, this field can be thought of as involving the tasks of identifying risks, assessing them, comparing them and managing them. On the other hand, there is the communication of risks as well as the perception of risk. Boroush (1998) is one of several scholars who provide an overview of the different aspects of the field of risk: In order to deal with risk at a scientific level, the risk needs first to be identified as such. Much of this identification and analysis happens within the field of risk analysis, which, according to Boroush (1998, p. 8), can itself be sub-divided into four parts:

- **Risk assessment** deals with questions like, how detrimental is risk X expected to be, and is it sufficiently detrimental to call for increased management and regulation of the risk (Boroush, 1998, p. 8)?
- **Comparative risk analysis or assessment** compares different risks and creates rankings in order to put forward priorities regarding which risks should be taken and which should not (Boroush, 1998, p. 10).
- **Risk management** asks three questions: 1. Which risks are potentially more detrimental than the society is prepared to accept? 2. What possibilities are available for

controlling these risks? 3. What appropriate actions are available that have the potential to reduce or eliminate unacceptable risks (Borouh, 1998, p. 11)?

- **Risk communication** includes different communication activities with the goal of increasing public knowledge of risks, as well as the goal of increasing participation in risk management (Borouh, 1998, p. 12).

These four fields all play a role in the initial identification of a risk, they calculate the extent of the risk, and they manage it. This role of defining a society's risks is part of the work of, for example, banks and insurance companies, which deal with different types of risk in the course of their everyday working activities (Borouh, 1998, p. 6).

In this study, however, risk communication is the focus of interest, and this makes up a whole field of research in communication science. Why this is so significant becomes evident when reading what Ulrich Beck says about our society: Beck (2002) says that we live in what he describes as a world risk society, where risks are numerous and present in everyone's lives. Not only do we face numerous risks but these risks are, according to Beck, no longer bound by time, space or social hierarchies, but they penetrate the society as a whole. Assuming this is so, and that risks affect large parts of society, there is a need to know about risks, and this is where risk communication comes into play.

From Baker's (1990) interesting overview of the development of risk communication, we learn that providing information about risks is a fairly recent phenomenon. He explains that, historically, government and experts from industry decided together on how to regulate the risks arising from emerging technologies. Without involving the citizens in decisions relating to risks, the experts, together with the politicians, arrived at their own conclusions. In these earlier times the mass media probably carried far less risk communication than they do today. It therefore does not come as a surprise when Baker explains that public opposition arose to this system in which only experts and government made the decisions (Baker 1990: 343). One can well understand that protests would arise when risk exposed people realized they were excluded from this decision making. According to Baker, during the seventies, simultaneously with the protests, risk analysis was developed in order to provide objective data about risks (Baker, 1990, p. 343; see also Otway, 1987). This data played an essential role in risk communication. The risk communication data that we consider today has all originated from some source. Risk information, and the initial communication of that information, come to us through various channels, and are, to greater or lesser degree, covered by the mass media. It is through the mass media that large parts of society today receive their information about risks. This media risk coverage, or as it is often called, risk communication, provides an initial source of risk information that is important to societies. It is, however, not the only factor that influences the risk perception of individuals. Other

aspects, such as social demographic factors, cultural context, factors influencing how individuals perceive risk and how they make decisions about risks all play a part.

Roughly, the field of risk communication research deals with risk communication from three perspectives:

- First, it deals with the perspective of *who* is communicating the risk at a communicator level. This is an area that is sometimes connected to the praxis, and therefore also covers where to find best practices of risk communication.
- Second, it deals with the *risk communication* or *risk coverage* by the mass media.
- Third, it deals with the *risk perception* of the recipient (Bonfadelli, 2004, pp. 286–287).

In this study, the focus is on risk communication, i.e. risk coverage by the mass media. The communication channel of the mass media is considered to be a good way, if not *the* way, of reaching out to society, and it is therefore of great importance when communicating risks. Because the mass media is society's source of risk information, it is both important and interesting to analyze how risks are represented in the mass media. However, in order to analyze risk coverage, a definition of risk must first be put forward that will enable risk coverage to be identified. This process of identifying what is to be understood by risk will be dealt with in the following sections of this study.

4.2. Existing Risk Definitions

When first looking into the field of risk perception by individuals, scientists discovered that “risk appears to mean different things to different people” (Sjöberg, Rundmo, & Moen, 2004, p. 7). These researchers were not alone in arriving at this conclusion (see, for example, the research by Paul Slovic⁷). But it is not only to laymen that risk means different things. Scientists dealing with the concept of risk also have different understandings and risk definitions, in which different dimensions are included. Bechmann (1993, p. 3) points out that even though risk research has tried, it has not succeeded in formulating a uniform definition of risk and therefore a coherent risk theory. This study is therefore not alone in drawing attention to this problem as it has been recognized and discussed by several scientists (see, for example, the discussion of this in Renn, 1998). Therefore, this study is also not the first to discuss different risk definitions (Luhmann, 1991, pp. 15–16; Aven & Renn, 2009). Even though this problem has been identified, risk coverage studies still rely on different risk definitions and therefore the question

⁷ There are many scientists dealing with risk perception. This paper does not aim to discussing them all, nor to provide a list of them all. Paul Slovic is a prominent name in the field, which is the reason why he is mentioned.

holds: if those studies do not agree concerning a definition of the basic term, do they analyze the same concept? Because this question and its answer are crucial, this study makes a fresh attempt to propose a definition of risk with the subsequent aim of developing a risk model that is detailed and empirically testable, namely to create a model that will make it possible to depict how risk is covered by the mass media. If this definition is then used by other scientists, it will facilitate comparisons between scientific studies on risk coverage. In the current state, where the field has not yet agreed on a basic definition of risk, comparisons and building on others' research are difficult. This study emphasizes the importance of arriving at a clear definition of the concept, and the conscious use of it will, at the very least, make a contribution to the field that allows it to move forward. By identifying the counter-productive process of re-inventing the wheel every time a concept is used, this study suggests a definition of risk that is based on what has already been discussed in the field, combining the risk dimensions into one multi-dimensional risk construct that can thereafter be used for empirical research. In order to arrive at the definition of this construct, existing definitions of risk will first be reviewed. This review aims to capture the diverse understandings of risk, to identify the dimensions of risk, and to put them together into one broad and multidimensional definition. This review does not, however, aim to discuss all existing definitions, but to present a variety of definitions that include important aspects of the concept of risk.

Rowe (1975, p. 1) points out "that risk is indeed complex, and that oversimplification is a temptation that can often result in misrepresentation of risk evaluation." According to him, common understandings and evaluations of risk are based on the "probability and the value of the consequence for various events [that] are combined to provide a statistical expected value" (1975, p. 1). There are several studies where the understanding of risk relies on this "mathematical" or "technical" risk concept, and this definition is often referred to as the mathematical product of the probability multiplied by the amount of damage, which gives the "amount" of risk (Bonfadelli, 2004, p. 290; Dahinden & Schanne, 2009, p. 70; Kasperson et al., 1988b; Renn, 2008). Rowe (1975), Kasperson et al. (1988b, p. 178), Bonfadelli (2004) and Renn (2008) are among those who criticize this understanding of risk for failing to capture the complexity of risk. It is criticized for being too "narrow and ambiguous to serve as the crucial yardstick for policy making" (Kasperson et al., 1988b). Bonfadelli (2004, p. 290) calls this definition the "safety technical risk definition" and claims that it comes from the mathematics of insurance. The definition is considered to be a useful definition in cases when statistical data is available on two dimensions: probability and the severity of the potential detriment. This can be illustrated by considering the case of car accidents: How probable it is that one will be involved in a car accident, and how severe are the detrimental outcomes likely to be? However, in cases where there are no statistical data on which to base this

calculation and risk cannot be quantified this definition is not very useful. This might also be the case in the production of nuclear energy where it is difficult to compile a statistical understanding of the risk. Even though there is a risk assessment method called PRA, meaning probabilistic risk assessment, which is used by the nuclear industry to assess the risks, this is a controversial approach. It is criticized in that it cannot “account for unexpected failure modes during many accidents” (see also Marais, Dulac, & Leveson, 2004; Ramana, 2011, without page; Renn, 1998). Regardless of whether certain risks are assessable or not, this definition is also considered problematic because it ignores the societal and personal understanding of risk, which are not only based on statistical data, but also on feelings, knowledge and other variables⁸ (Bonfadelli, 2004, pp. 290–291; Renn, 1998, 2008).

Rowe describes risk as occupying three “domains”. The first is the “Event Space Domain”, which is an event that can occur with a specific probability. The second domain involves the consequences that the event can cause, which Rowe calls the “Probability-Consequence Domain” and which he says has its own probability. According to Rowe, the third and last domain, which Rowe calls the “Consequence-Value domain”, is the most important, because, as he says, it is not the “magnitude of consequence that is meaningful to risk takers” but it is the “value” of the consequence that the risk taker gives to the consequence. This valuing of consequences is subjective, and therefore consequences will be valued differently by different individuals (Rowe, 1975, pp. 8–9). Both Bonfadelli (2004) and Renn (Renn, 1998, 2008) point to this same factor when they state that there is subjectivity in risk perception, this also points to the fact that risk perception does not have to be based on statistical data. Arising from these explanations of the domains, Rowe defines risk as “the functional combination of the probability of occurrence of a consequence and its value to the risk taker” (Rowe, 1975, p. 10). Dimensions identifiable in this definition are the probability, the consequence and the value. Although this definition leaves out the dimension of computing, it does add the dimension of the individual valuation of the consequence. This becomes an important aspect to consider when dealing with risk perception. Taking a step back and away from the risk perception perspective, and looking at a similar definition that is given in an article by Derby and Keeney (1981), *How safe is safe enough?* one learns that they define risk as the “possibility of consequences involving mortality, morbidity, or injury to members of the public” (Derby & Keeney, 1981, p. 217). So here, the focus is more on the negativity of the consequences and the harmfulness to the people in society. Similar definitions are found in many other studies: For example, Ruhrmann (2003a, p. 539)

⁸ The factors influencing risk perceptions are many, but will not be discussed here.

defines risk as conceptions of threatening harms that can occur against a certain probability. These and similar definitions concentrate on the **potential** and the **probability** of **negative consequences** happening to **someone** or **something**.

When reading risk communication studies, it becomes obvious that not only are there very different definitions of the concept, but that other words, like danger, harm or hazard, are used as if they were interchangeable with risk. When thinking about what risk is and what it may not be, it is important to distinguish the concept of risk from these other, similar concepts. Baker (1990) for example, distinguishes between risk and hazard: He discusses this distinction with help from the definition of a hazard provided by the Committee on Risk Perception and Communication of the National Research Council (1989), where a hazard is defined as an action or occurrence that will potentially cause harm to people or things. The extent of the harm is called its magnitude, and the magnitude is measured by the number of people or things that will be affected and by the severity (Baker, 1990, p. 342, see also; National Research Council, 1989). This definition of hazard is very similar to the risk definitions already discussed above—in that it mentions the potential for harm (negative consequences) to people and things. Within these definitions, risk and hazard are seen as the same thing. Risk is, however, defined by Baker (1990: 342) as “the quantification of a hazard in terms of the probability that harm or undesirable results will be realized.” Baker (1990) provides the following example when differentiating between hazard and risk: “People building their homes on a flood plain that experiences a severe flood once in twenty years face the same hazard as people building in a similar area that experiences an equally serious flood once in a hundred years, but they face five times the risk” (Baker, 1990, p. 342). This implies that the foreseeability and probability of a risk constitute the distinction between hazard and risk, which is also the distinction that Renn (2008, p. 50) supports in his discussion of what sets a hazard apart from a risk. Probability (that is predictability to a greater or lesser degree) is an important part of the definition of risk, but it is not the main dimension contributing to the difference between hazard and risk. The probability of hazards can be predicted to a certain degree too. Instead, if we look at something as simple as the linguistic expression “to take a risk,”⁹ it implies that one has a **choice**. One can **decide** whether or not to take a risk. This distinguishes risk from other forms of harm that “just happen to us” without our making the decision to put ourselves into the potentially harmful situation. This important differentiation is supported by Luhmann (1991) when he makes the distinction between risk and the often synonymously used term “danger”¹⁰

⁹ Also in other languages, like German, “ein Risiko eingehen”, or Swedish, “att ta en risk” – this becomes evident.

¹⁰ In German “Gefahr”.

(Luhmann, 1991, pp. 30–31). Luhmann defines danger as something that is caused by external powers and does not include a **decision** (Luhmann, 1991, pp. 30–31). A danger could be an earthquake—something coming from outside. Luhmann claims that a risk is not to be considered a risk if there is no identifiable decision by which the potential harm could be avoided (Luhmann, 1991, p. 25). See Figure 4 for a visualization of risks versus dangers.

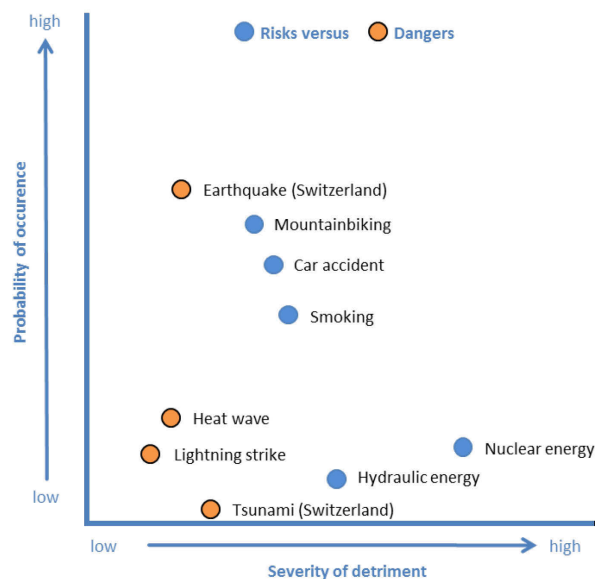


Figure 4 Illustration of Risks versus Dangers¹¹

Beck (2002) also includes decision-making in his understanding of risk as he discusses the concept of control that he sees connected to risk (Beck, 2002, p. 49). Therefore, when speaking about risk, there is the possibility of avoiding the detrimental outcomes, and this involves a decision. So why do we “take the risk” of a detrimental outcome? Risk does not only involve negative consequences of varying severity that happen to someone or something, and are probable to a certain degree. If risk were only that, why would people ever engage in taking risks? If risk communication and media risk coverage covered only the possible negative consequences that might happen to individuals, would the recipients see any reason for taking those risks? When deciding whether or not to take a risk, one additional dimension of the risk must be known and communicated and that is the **benefit**. If people thinking about taking risks only knew about the possibility of something negative happening, they would never take those risks. This important claim is made, for example, by Gale (1987, p. 73) as well as by Dahinden and

¹¹ The plotting of risks and dangers in this figure is not based on statistical data. It aims only to illustrate the difference between risks and dangers and approximately shows their detrimental probability and severity.

Schanne (2009, p. 70). In their understanding of risk, these writers add the dimension of benefit, and claim that without this aspect it is not clear why anyone would be prepared to put themselves into a situation of possible negative consequences. Therefore, they speak about the ambivalence that comes with the concept of risk. There is possible detriment on the one hand and possible benefit on the other. The dimension of **uncertainty** is added because of the inability to know whether the outcome will be to the detriment or to the benefit of the recipients (Dahinden & Schanne, 2009, p. 70). In defining risk, the dimension of benefit is as important as the potential for detriment. We are not speaking about risk if we have situations without any benefit. An earthquake, for example, has a certain probability (predictable to a greater or lesser degree) of happening; it can have negative consequences, but it does not have any benefits and is therefore not a risk, it is a danger in Luhmann's (1991) sense. Developing this concept further, Aven and Renn (2009, p. 1) define risk as referring "to uncertainty about and severity of the consequences (or outcomes) of an activity with respect to something that humans value". Although this definition does not explicitly mention benefits, negativity of consequences and decisions, together with earlier work by Renn (2008), it does introduce **uncertainty** and **severity** regarding the outcomes. Renn's earlier definition of risk "contain[ed] three elements: outcomes that have an impact upon what humans value; the likelihood of occurrence (uncertainty); and a specific context in which the risk may materialize" (Renn, 2008, p. 50). By not mentioning whether the consequences are negative or positive, it could be interpreted as implicitly including both aspects. However, in this article, Renn does discuss the size of the harm (the severity) and of the benefit, the decision, the evaluation of the risk, and the context in which the risk occurs, although he does not explicitly include these aspects in his definition. He therefore pursues a similar purpose as this study, namely a review of different risk concepts (Renn, 2008).

Even if within the vast range of risk definitions all essential parts of the concept of risk are covered to the best of this study's knowledge, all of these earlier attempts lack one or more dimensions and their empirical measurement. Turning to risk perception studies, it is well known that not only the beneficial and detrimental dimensions influence people's risk perception, but also probabilities, impacts, voluntariness and influence possibility, that is whether a decision is possible (Frewer, Miles, & Marsh, 2002; Kasper et al., 1988a; Renn, 1986; Slovic, Fischhoff, & Lichtenstein, 1982). Media risk coverage influences people's risk perception; therefore, analyzing all risk dimensions in media content will give not only a more comprehensive picture of medias' risk coverage, but also clues to why risks are perceived as they are by the public.

Because the definitions of risk are incomplete, and because there are studies that lack a clear notion of what a risk is and what it is not (danger, hazard etc.), the discussions of

other scholars (for example, Luhmann, 1991; Renn, 2008) on the concept of risk open the question of whether these studies can make statements on the risk communication performance of the mass media, and whether this research is comparable to other risk communication studies. To take just one example, the study of Singer and Endreny in 1987 says that “The media do not report on risks; they report on harms” (Singer & Endreny, 1987, p. 14). On taking a closer look at the sampling method of their study it becomes clear that they sampled “every story dealing with a hazard or group of hazards” (Singer & Endreny, 1987, p. 12). With such a sample it seems doubtful whether it is possible to conclude whether or not the media reported on the risks. In order to get beyond this dilemma, evident not only in this one study, and the questions it raises regarding risk communication studies, this study suggests both a definition and a broad understanding of risk, so as to create a more deliberate usage of the term.

4.3. A Compiled Risk Definition

Inspired by all of the definitions discussed in the previous chapter, this study brings together all dimensions that are considered relevant and proposes a broad and multi-dimensional risk construct. This definition is the core of this study and is essential for the empirical analysis. The here proposed risk definition is considered to be of value when analyzing media risk coverage.¹²

As has been argued, when looking at risk communication by the media, it is important to have a clear idea about what risk is and what one is looking for in media coverage of it. Risk is not only loss, danger, probabilities of a negative event, the opposite of benefit, uncertainty, etc. In this study, risk is considered a multidimensional construct:

Risk involves a **decision** and a more or less conscious weighting of potential **benefits** and **detriments**, including their **probability** to occur, the benefit **degree** and detriment **severity**, and varying degrees of **uncertainty**.¹³

With this definition, risk is a multidimensional puzzle (see visualization in Figure 5) made up of six main parts and is here visualized as a flower. It can be used to define risk at the individual (micro), organizational (meso) and broad public (macro) levels of society. The construct combines the negative and positive sides of risks, the probabilities of

¹² It intentionally does not include the notion of risk perception, because this is considered to be a research field on its own, and risk perception is dependent on more influences than the media coverage of risk alone.

¹³ An similar version of this definition was published by Kristiansen and Bonfadelli (2014) in German. The definition presented here is a slightly refined version that captures risk in a more precise way. The main difference lies in the way the probability, degree and uncertainty of the benefit, not only the detriment, are also considered here.

both occurring, the potential degree (benefit) and severity (detriment) and the uncertainty of both. The definition considers the decision by which a risk is taken. When referring to risk hereafter, this whole concept is implied. That means that when the word *risk* is used, it does not only imply something potentially harmful, but it encompasses this multidimensional risk construct discussed in this section.

The *decision* comes first, and is therefore at the root of the flower, because all risk taking involves a choice of yes or no and, therefore, a decision. The flower analogy implies that if one picks the flower one has the whole risk construct in the hand, including its negative and positive sides, their probabilities, uncertainties, degrees and severities. This decision is made at different levels in society. It can be a single person deciding whether or not to smoke or to go down a dangerous trail on a mountain bike, that is, whether to take an individual risk. It can be a decision made by the stakeholders of organizations, for example when deciding whether to be involved in an economic risk while investing in a new technique. It can be a risk decision at a societal level where a referendum decides on taking risks that affect the whole society, as, for example, the use of nuclear energy (a technology that if used includes the possibility of an accident and has a high probability of different benefits (i.e. energy, environmental benefits etc.)). However, if it is not taking the risk of nuclear energy, the society is faced with other risks, for example, climate change due to the use of other less climate-friendly energy sources. Decisions can be taken at a parliamentary level by the elected politicians only. Thus, risk decisions are taken at individual, organizational and societal levels by different actors or groups. The *decision* being part of media coverage can involve the explicit mentioning of the choice and the possible decision to be made, or it can be the mention or discussion of a referendum, or it can be the (political) discussions around the decision. The decision is, on the one hand, part of the risk context in the sense that when making a risk decision, the decision-maker (ideally) takes all other dimensions into account, e.g. how high the probability and degree of the benefit is, versus how high the probability and severity of the detriment is and how much uncertainty surrounds these values. On the other hand, the decision is sometimes at the same time one of the dimensions a decision-maker considers when evaluating the risk. This means that when a decision-maker evaluates a risk, the way in which she/he can decide upon the risk could potentially influence the risk decision itself. The risk decision might be influenced by whether the risk decision is easily reversible; for example, one can decide to start to smoke, but the decision to stop smoking is uncomplicated to make. Yet, if the risk decision is difficult to reverse, for example if a whole population is involved in a referendum and new campaigns etc., would be needed to re-decide, the decision-maker might take this into account when making the risk decision. This study considers decision in both ways.

may be of not taking the initial risk; that is: what are the alternatives if I do not take the risk (Derby & Keeney, 1981, p. 218)? As in the case of nuclear energy, not taking the risk of utilizing the technique may mean an energy shortage as well as a higher output of CO₂, which can speed up climate change. Both the detrimental potential of the risk itself and the possibility of “follow-up risks” lie in the future.

Detriment can take many different faces; for example, an accident with the mountain bike on the cool trail, severe sun burns and skin cancer, the unforeseen detrimental consequences of genetically modified plants, economic loss, reputational loss, or nuclear accidents with all their possible consequences. The difficulty with risk is the *probability* of detrimental occurrence. The *probability* of potential detriment is predictable to a greater or lesser degree. The probability of having a car accident is quite well statistically explored and explained, whereas the probability of a nuclear power plant accident is much more difficult to calculate. Severe nuclear power plant accidents are difficult to predict because they are rare. The probability of detriment can be high or low, and easy or difficult to predict. The *severity* of the detriment is also predictable to a greater or lesser degree. When smoking, one will not necessarily get lung cancer and die of it; perhaps a smoker will just get a light cough or not notice any detrimental effect at all. When running a nuclear power plant, incidents can also be of low severity—not endangering any humans, animals, or the environment—but accidents can happen that, for example, leave large areas of land uninhabitable. *It is the uncertainty of the detrimental occurrence and its severity that make risk taking so difficult.* Before making a decision, one tries to evaluate or “calculate” the benefit and the possible detriment in order to “make the right decision” when saying yes or no to the risk. This is the so-called cost-benefit calculation (see for example Fischhoff, 1990, p. 651). To summarize, the dimensions of risk considered here are: decision, benefit, detriment, probability, severity and uncertainty. All of these dimensions are essential for the here proposed risk definition. This study emphasizes the importance of not only looking to the negative side of risk when studying risk coverage. The decision and benefit are important dimensions too, for the risk understanding of this study, but also for the risk taker evaluating a risk. With detriment and consequence being mentioned in many different definitions, an emphasis should be put not only on the inclusion of the decision and the benefit, but also on the multidimensionality of risk and the inclusion of all of the discussed dimensions. As Luhmann (1991) said, without decision there is no risk. Without decision and benefit there is no risk. However, without probability and detriment there is also no risk—risk is a compound of all of the discussed dimensions. That is the originality of this study, the broad inclusion of risk dimensions and the implementation of these dimensions in the empirical analysis.

When making a decision about whether or not to take a risk, these dimensions are, with some degree of awareness, taken into consideration. As mentioned above, the type of decision itself will sometimes also be one of the decisions taken into consideration, e.g. whether or not the decision is easily reversible or not. In some situations, all risk dimensions are known and the decision is made on a well-informed basis. When making other decisions, some of the dimensions may not be so well known. If making a decision whether to smoke, one may be informed by the warning text on the cigarette package that smoking can damage one's health, but certainly only a small number of individuals will have read the studies showing the actual probability of the different health issues that can occur and their severity. Risk decisions are often complex. In some cases the information given to risk decision makers may even be contradictory. For example, different experts can present contradictory facts, or politicians can argue along different lines, emphasizing different facets of an issue. In these situations it may become increasingly difficult to make a decision. Nuclear energy would be such a case. In this situation, politicians from different sides will present differing opinions on nuclear power and speak about varying probabilities of a severe accident happening, while also emphasizing the benefits of nuclear power to different extents. Politicians are expected to disagree with each other, but when experts also speak about risk in contradictory ways, making a decision becomes even more complex. Not only is decision making difficult in cases like that, but the risk communication of the mass media also becomes critical in such cases. Most journalists also do not know if there is "a right and a wrong". As it is with risk, so there will not be a clear-cut right or wrong in the risk communication, but individuals and societies will still have to decide upon the risk and whether it is worth it for them. The mass media is the source of risk information for most members of society, and this is why it is so important that the mass media should cover all facets of the risk, discussing all sides of the issue. If the people who are making a decision are well informed¹⁵ about the risk, including the benefits, detriments, probabilities, and severity, as well as the uncertainty of the probability, they will not necessarily have an easier time making their decision, but at least their decision will be legitimate. If all the available facts and opinions are on the table, then the risk takers, and those people who potentially will be detrimentally affected, at least know about the risk. In the ideal situation, the people who are potentially to be affected detrimentally are the decision makers and are also affected by the benefit. (For a discussion on decision makers, benefiteres, and the detrimentally affected, see Luhmann, 1991,

¹⁵ To have all information made available through media coverage that is needed to be "well informed" does not automatically produce "better" informed citizens. Provided information might not be consumed, and even if consumed they might not be regarded in a way which enhance the information level.

pp. 119–120,¹⁶ and also Beck 1986, pp. 61–62.) This ideal case, where information is provided about the risk, may be utopian, but perhaps it is not. This study aims to find out how the mass media represents the dimensions of risk. When considering the issues around nuclear power, it does seem quite probable that the benefits of nuclear power have been discussed in the media. When, between 2008 and early 2011, the building plans for the three nuclear power plant operators were under discussion, did the media cover the benefit that would result from these future nuclear units? Were the possibilities of detrimental outcomes considered at the same time? After Fukushima, the detriment was certainly discussed. How long did it take before the possibility of detrimental outcomes in the home nuclear power plants became a topic for discussion? At what point did the supporters of nuclear power speak about the low probability of detrimental outcomes? When posing these and other questions it seems likely that risk communication can be identified according to this definition of risk. This study is eager to find out how this happens.

4.4. Risk Communication

Speaking about how risk is discussed by the mass media makes it inevitable to not mention risk communication as a concept and to take a closer look at it. As does the term “risk”, “risk communication” also has many different definitions. However, when the term “risk” is clearly understood, it is easier to define what risk communication is. Repeating the definition of Morgan et al. mentioned in the introduction, risk communication means “communication intended to supply laypeople with the information they need to make informed independent judgments about risks to health, safety, and the environment” (Morgan et al., 2002, p. 4) (see also Fischhoff, 1990; Gibson, 1985; Gow & Otway, 1990)). In this definition, only laypeople are mentioned to be the “ones to be informed”, but more importantly, risk communication should supply them with all the information they need to make informed decisions on risk. It is not only this definition that has a normative stance. Many risk communication definitions, as this chapter will show, relate to the notion that the public “should be informed” upon risks. Seen from the perspective of potentially affected people this notion is understandable. However, it shall be considered that more or “sufficient” amount of information does not automatically mean a well-informed public, as information might not be received, might fall into a thought pattern of the recipient in which it is not considered, or not understood and so forth. Therefore, even if many definitions imply a notion of a normative “should”, it

¹⁶ For a discussion of the paradox that occurs when a decision maker is not the same as the detrimentally affected, and if a risk is then considered a danger because it is externally caused, see Luhmann (1991, chapter 6)—but this is a paradox I will not go into here.

does not mean that if risk communication did supply all available information that this information would lead to a fully informed public. Even a fully informed public might for different reasons not make use of the information in their decision making.

Nevertheless, the aspect of informing groups of the population or the whole society of risk is an aspect seen in many risk definitions. In Plough and Krinsky's (1987, p. 6) definition, "[r]isk communication can refer to any public or private communication that informs individuals about the existence, nature, form, severity, or acceptability of risks," as well as specifically mentioned in the definition of Lundgren and McMakin (2013, p. 1), "Risk communication involves people in all walks of life—parents, children, legislative, representatives, regulators, scientists, farmers, industrialists, factory workers, and writers. It is part of the science of risk assessment and the process of risk management." Ruhrmann (2003b, p. 542) sees risk communication as a process in which the uncertainty concerning future damages is discussed. Renn (2010) clearly defines the goal of risk communication, "The ultimate goal of risk communication is to assist stakeholders and the public at large in understanding the rationale of a risk-based (risk-informed) decision, and to arrive at a balanced judgement that reflects the factual evidence about the matter at hand in relation to the interests and values of those who are affected by the consequences of the risk. In other words, good practices in risk communication are meant to help all affected parties to make informed choices about matters of concern to them" (Renn, 2010, pp. 177–178). In Renn's (2010) definition, the goal of risk communication is also to inform individuals that through the information they receive, potentially would be enabled to make informed judgements and decisions on risks.

Inspired by the risk communication definitions discussed here, this study suggests a risk communication definition based on the risk dimensions. Risk communication can be identified when those dimensions are present in either direct communication efforts or in media communication:

Risk communication is any form of communication that informs upon a **decision**, which includes weighing of potential **benefits** and **detriments** against each other, based on information about **probabilities**, **degrees** and **severities** concerning both the benefit and the detriment, which are **uncertain** to a lesser or greater degree.¹⁷

If over time informed on all these risk dimensions identified and discussed above, an informed risk judgement would potentially be enabled. If actors closest to the risk

¹⁷ This definition does not imply that if one or more of the dimensions are missing, it is not risk communication anymore. There will of course be communication efforts that include only some of the dimensions and communicate only parts of the whole risk construct. This is discussed further down.

source would provide all available information, and those were communicated to the general public, any risk decisions could be seen as legitimized. However, it should be taken into account, that even if all information were communicated to the general public, this does not automatically mean the general public absorb the information and base their decisions upon those.

Still, the information on these risk dimensions will most likely be revealed by actors or instances close to the “risk source”, who have the knowledge and information. In the view of this study, this is where risk communication occurs and originates from. The risk communication that is presented by the mass media is more precisely considered to be risk coverage. Since most studies in this field call risk coverage risk communication, those terms will both be used in this work. When not mentioned otherwise, they both indicate risk coverage by mass media.

Ideally, in a first step in risk communication, it would be essential that the information on all the mentioned risk dimensions is released by the ones who have access to this information. In a second step, this potentially enables mass media to pick up on the information and present it in their risk coverage. Mass media risk coverage is potentially a source where large parts of the population can get access to risk information. In the process of identifying and analyzing mass media risk coverage, all risk dimensions should be considered. This raises the question of whether or not all risk dimensions have to be included in every news cast or article – that is on an article¹⁸ level. This study argues that this does not have to be the case; not all dimensions are expected to occur on an article level. Not only is it not considered necessary to constantly repeat those dimensions in every news article, it would also be unnatural for journalists to communicate all the facts and information they have on an issue every time they cover it. Other than that it would be too demanding for journalists to in every single article on risk to mention all those aspects. Additionally, this kind of coverage would be tedious to recipients and not considered necessary. It can be assumed that recipients consume not just one single article on risk, but much rather regularly consume media coverage and therefore potentially would receive information on all the risk dimensions over time. The coverage over time will compile and form risk coverage – that is, if all dimensions are discussed, which is still a question waiting for empirical analysis. Without going into detail on the frame approach in communication science, it should be mentioned that this perception was inspired by and is similar to the concept of frames that Entman (1993) supplies. There are certain frame *elements*; these do not all have to be present on article level, but can come together over larger parts of media coverage and in this way compose frames.

¹⁸ “Article level” meaning press articles as well as news features in electronic media.

This is how risk dimensions should be considered as well. They do not all have to be present on an article level, but coming together over time they form risk coverage.

Why it is so important that risk coverage does cover risk and all its dimensions as discussed above becomes clear if considering media coverage that would only cover the negative side of risk. As discussed and seen in many risk definitions, the negative part of risk is what constitutes risk for many scholars and which is also empirically analyzed. But if individuals as risk takers were only aware of the negative part of risk, it would not make sense that risks are taken at all. This leads to the assumption that individuals as risk takers are, in fact, informed and aware of other dimensions of risk besides just the negative parts. This assumption, of course, would have to be empirically tested. With the risk definition and risk communication definition suggested here, and with no study to the best of my knowledge empirically studying all these risk dimensions concurrently, the research question of this study is: how do media report on risks?

Because of previous research conclusions, including the statement by Singer and Endreny (1987, p. 14) that “media do not report on risks” only on harms, this research will, on a more differentiated level, explore whether media do report on risks, and how they do it. In addition to triggering the interest in answering this questions, the statement of Singer and Endreny (1987) also leads to the research question regarding whether media might have a phase pattern to its risk coverage. Because it might be true, that immediately after a detriment, which is the time period most risk communication studies study, only the harm or the detriment are covered by the media. That would suggest that the benefit is covered at another point in time. So risk communication is assumed to have a phase pattern. Therefore a well-known phase model of public attention shall be focused upon next. The so called “Issue Attention Cycle” was posed by Anthony Downs (1972), and has inspired the phase thinking of this study. It and other similar concepts and approaches shall therefore be discussed here.

5. Media Attention & Media Reality

It is widely known that problems and issues compete for attention (Hilgartner & Bosk, 1988, p. 54) on different levels of society and in several arenas. In the field of social sciences, including communication science, the question is asked: why do some issues garner attention and others do not? The sociologist Blumer argues that social problems can only exist if they are identified by society as problems or issues (Blumer, 1975, p. 112) (see also Schetsche, 2008, p. 20). Social scientists analyze the attention that different problems or issues get in different arenas of the society: for example which issues get attention in the public arena (agenda-setting) (Cohen, 1963; Henry & Gordon, 2001; McCombs, 1981), or on the policy arena (see, for example, policy cycle studies Jann & Wegrich, 2009; Peters & Hogwood, 1985) and how the attention an issue gets on one arena influences the attention it gets on another. As Hilgartner and Bosk point to, it is not the harm itself or the “importance” of the issue that alone manages to explain why some issues or problems are more “marketable” than others (Hilgartner & Bosk, 1988, p. 54). There are complex societal processes that interact with and create an opportunity for an issue to gain attention. Schetsche suggests a process model for societal issues which describes phases that issues go through. In this model, actors that promote and define issues are important, and the mass media is one example in this model (Schetsche, 2008, p. 50).

On the level of mass media, there is for example the classical concept of news factors, which describe characteristics that events possess, which make them newsworthy. This theory goes back to Lippmann (1922) and has been used and developed by several scholars after that (see for example (Buckalew, 1969/70; Chang, Shoemaker, & Brendlinger, 1987; Dimmick, 1974; Fretwurst, 2008, 2008; Galtung & Ruge, 1965; Östgaard, 1965; Schulz, 1976; Shoemaker, 1982; Staab, 1990). The factors vary slightly in the different studies, the ones of Schulz (1982) however are often seen referred to and used by others. He describes 19 factors which he orders under six dimensions (Schulz, 1982, pp. 152–153), here summarized after Staab “status (élite nation, élite institution, élite person), valence (aggression, controversy, values, success), relevance (consequence, concern), identification (proximity, ethnocentrism, personalization, emotions), consonance (theme, stereotype, predictability) and dynamics (timeliness, uncertainty, unexpectedness)” (Staab, 1990, pp. 426–427). An example for this would be an event that represents a controversial issue like nuclear energy, with a high identification value because it happens in another developed country (Japan), which triggers emotions (i.e. fear), and happens unexpected has a high news value and a high chance to be covered by the media, like Fukushima. Accidents and risks are prone to trigger media attention, because they assign to several news factors. The news factors Schulz (1982) and others

define, can be used to analyze why some events are reported by the media and others not. This study however focuses on one specific event, Fukushima, which was heavily covered by the media. In monothematic studies, like this one, that does not compare which issue was reported over others, some news factors will be constant. Taking the nuclear accident in Fukushima as an example: the event happened in an élite nation, the nuclear issue is controversially discussed, the accident triggers emotions, it came unexpected etc.. Those are surely some factors contributing to the events' and the nuclear energy issues' newsworthiness. One reason for this study to investigate media coverage around Fukushima because of its heavily coverage, which enables an analysis of risk coverage of nuclear energy, not only in a routine phase. The interest of this study is however not the identification of news factors. The aim of this study lies in the identification of risk dimensions and their development over time. This study focuses on the mass media coverage and the phases a specific issue potentially goes through by emphasizing different risk aspects of one issue at different times. As for Schetsche (2008) also actors and their issue definitions are relevant out of the point of view how they and their arguments are presented by the media. This chapter will focus on the media arena and describe approaches that try to better understand how (foremost media) attention evolves over time, as well as how particular events can influence issue attention. This will enable this study to suggest a phase attention model specifically for risks, a risk attention phase model.

In the early seventies, seemingly independent of each other, Luhmann (1971) and Downs (1972) both discussed how issues are given attention. Luhmann described political "theme careers" (p. 18) and Downs described the Issue Attention Cycle in order to explain public attention. In his article Downs asked the question why certain issues gain attention all of a sudden and how long they hold the interest of the public at a high level. He looks at the example of the in the sixties and early seventies upcoming environmental issue, and claims that nothing in the environment at that certain point itself changed that much—i.e. there was no triggering event—as that it could explain the sudden rise of public attention to and interest in it. Downs asks why and suggests a model to explain this rise and fall in attention, which he calls the Issue Attention Cycle (Downs, 1972, pp. 38–39). The model is "rooted both in the nature of certain domestic problems and in the way major communications media interact with the public" (Downs, 1972, p. 39). Downs mentions three characteristics that will apply to problems that go through the Issue Attention Cycle: They will concern a certain amount of the population to be able to attract the interest of the greater public attention; they will contain benefits for some and suffering for others; and the problem has to have a certain amount of excitement in order to catch public attention in the first place (Downs, 1972, p. 41). When this applies to issues, as it does to, for example, the issue of nuclear energy, there is a big chance

that the issue will enter into the issue attention cycle at one or several points in time. When looking closer at the issue of nuclear energy it becomes clear that the benefit of nuclear energy applies to the whole population of Switzerland. If, however, an accident happens, it might directly affect only a smaller part of it. At the latest, however, the whole population will be affected if energy prices rise after a nuclear phase-out. Nuclear energy as such is probably not an exciting topic to most people; however, an accident on the level of Fukushima will certainly catch most people's attention. Therefore, if those criteria are matched, as they seem to be at the latest when Fukushima triggers attention, there is a high probability that the nuclear energy issue will enter into the Issue Attention Cycle for which Downs (1972, pp. 39–40) (Downs, 1972, pp. 39–40) describes and give names to five stages:

1. The pre-problem stage
2. The alarmed discovery and euphoric enthusiasm stage
3. The stage of realizing the cost of significant progress
4. The stage of gradual decline of intense public interest
5. And the post-problem stage

Luhmann (1971) also describes a first phase of latency¹⁹, in which only some few actors are interested in the issue and it is dormant until it has accumulated enough political power to start its "career". Luhmann connects this trigger to the actors promoting the issue. If or when the issue gains attention it enters into the structure of a communication process and it becomes known to the broader public and is also communicated by the mass media. This is the point in time where the issue can disconnect from its initial promoting actors and become a part of a political discussion; according to Luhmann this is where it reaches its culminant point and where time becomes a factor. Soon, an issue fatigue can arise and the issue will lose its power and its career will come to an end. If the problem of the issue was not solved, Luhmann claims it would have to start over again with a new career (p.18-19). The structure of the "theme career" that Luhmann describes is very similar to the one of Downs, whereas Downs describes it and its phases in more detail. Assuming an issue enters into an Issue Attention Cycle, what happens to the issue then?

As Luhmann, Downs also claims that before an issue has caught much attention, it is in the *pre-problem stage*. At this stage a latent problem exists, which might be quite severe

¹⁹ The question of latent issues is also one asked in sociology and objectivists, who try to identify latent problems of society that are existing, but have not yet been discovered. It is however discussed how science can identify such issues before they do gain attention (Schetsche (2008, pp. 32–33).

even before public attention is pointed to it. Downs mentions the example of racism. In this first stage, or phase, there will be specific actors, for example experts and interest groups who know about the issue and engage in it, but the issue has not yet reached the attention of a greater public. For some reason the problem rises to the surface. This might happen as a result of a dramatic key event, and all of a sudden the problem becomes widely known and interesting to the broader public. Downs calls this stage the *alarmed and euphoric enthusiasm* stage because of the American culture tending to be alarmed about problems but at the same time, euphoric in the sense that they think they can solve the problem. The public knowing about the problem puts pressure on politicians, who are then urged to solve the problem (Downs, 1972, p. 39). In the third stage, society *realizes that there is a cost* to the solving of the problem. Therefore, there might be a measure of rationality entering the discussion in this phase. This might be the stage where the problem becomes a real issue, because the issue is being discussed prominently and groups, with different interests, are forming. Downs mentions the example of traffic. To some, the personal car is of huge benefit whereas instead of to others it is as a smog producer. In the discussion of the problem, many become aware of the costs of solving the problem and then interest might start to decline. As Peters and Hogwood point out, it is unclear in Downs' model, whether or not policy or organisational actions have been implemented at this stage or not. They focus on the attention of the policy area and claim that it makes a difference if the realisation of the costs arises before or after policy response to the issue. They argue that if the issue has entered into the policy arena it cannot "automatically self-destruct when costs become apparent or interest declines" (Peters & Hogwood, 1985, p. 239). However, interest starts to decline due to the realization of how difficult it might be to solve the issue and this is what happens in the fourth stage, which Downs calls the *decline of public interest* stage. The transition from the third to the fourth phase might be smooth as there is a gradual decline in interest. The cost of solving the issue might become clearer to many more people and this might result in a certain degree of discouragement, others might just lose interest because of boredom, and some that still feel a threat when thinking about the problem, might try not to think about it because also they realise how difficult and costly it might be to find a solution. Often at the same time, a new problem is entering the second stage of the Issue Attention Cycle and drags the attention away from the first issue and points it to itself instead (Downs, 1972, p. 40). In the last stage of the cycle the issue is no longer in the centre of public attention, but it has entered a mode of stand-by. It is an issue that has already been on the public agenda and, therefore, the public knows the issue and therefore it has higher probability to become an issue of attention again. The threshold of entering into a new attention cycle is lower and therefore this last stage can be seen as a stand-by mode (Downs, 1972, pp. 40–41). Those phases can last differently long, but

according to Downs they will in most cases appear in the suggested order (Downs, 1972, p. 39).

Having discussed the essential beginnings of phase models regarding media attention, and before proceeding to examine further studies which have applied and development those approaches, a phase model from the field of political science and political communication is relevant to outline. The two approaches, the communicational and the political, have similarities and the media have influence on the policy cycle. The two arenas, the media arena and the policy arena can be considered to be intertwined. The so called policy cycle which Jarren and Donges (2011) describe is especially interesting to consider when dealing with risks. Since risks are taken by decision and in the case of nuclear energy this risk decision is one that is taken on a political level, the issue of nuclear energy will at different stages in the development and implementation of the technology go through the policy cycle. The policy cycle also develops upon what was mentioned previously; Peters and Hogwood (1985) claimed that an issue, which has entered the political process of decision taking, cannot just be pushed away without having been dealt with. For risk issues and risk coverage this implies that if a risk, for any reasons, enters the political process and the policy cycle, the issue is prone to go through the political process. This fact can be combined with the question why and when issues enter into the policy cycle. On the other hand, what would this imply for media phase models? To which degrees are those cycles dependent from each other? Jarren and Donges (2011) suggest a policy cycle and also discuss medias role in this cycle, here it shall briefly be described. The phase model of the political process is considered to have six phases, in some of which the media and other societal actors are described to have stronger or less strong influence. The first phase is called problem articulation and the media are considered to have very strong influence in this phase, as this is the arena in which different actors articulate and debate problems. Jarren and Donges (2011) claim that the media debate can at this point decide if the issue enters into the political agenda. The second phase is the problem definition in which the media are considered to still have large influence on how the problem is discussed and defined. In the third phase however, the phase of policy definition, the issue leaves the public sphere. Now foremost political actors and experts take on the issue and the solution to it. In the fourth phase, the program development, the issue enters into the law process. At this point of the policy process political institutions and their actors are crucial. Also in this phase the media does not have much influence. The fifth phase is the policy implementation, which is a process of which the public only very seldom take notice. Here the administration of the policy implementation is taking form. In the last and sixth phase, the political solution to the issue can be evaluated and then again trigger public attention. If the solution or new laws pose problems for actors, a new problem articulation can start

off and trigger a new policy cycle. The consideration that media seem influential to whether an issue enters into the policy cycle, enables better understanding of the course media attention take and the phases an issue goes through on the level of media. If an issue enters the policy cycle it can not self-destruct as Peters and Hogwood (1985) claim and might therefore be prone to trigger media attention during the course of, or at the end of the policy cycle. On the other hand, as we shall see, there are researchers (see for example Graf, 2003), who claim a political solution to an issue will let media attention decline. If this holds true for nuclear energy after Fukushima, the empirical analysis of this study will answer.

The idea of a risk attention phase model, considering mass media attention to the different risk dimensions is going to be presented here. Before proceeding to examine how such a risk attention phase model could be defined, it will be necessary to further explore what different media attention phase studies have investigated. Risks share some notions of the environmental issues that Downs (1972) focused on and therefore his model is important to this study. First, of course, many environmental issues are risks. Second, risks issues like any other issues cannot always be in the same (high) state of attention. This is due to different reasons; for example, the media cannot constantly cover all the risks that society is exposed to. Also, the media tend to “forget” about some risks—those which seldom lead to detriment, but which still might have potential to be severe. Having said that, we face the dilemma that the media cannot permanently cover all the risks a society is facing (Kitzinger & Reilly, 1997, pp. 320–321). Third, as with the issue of the environment back then when Downs (1972) analyzed it, nothing in the factual basis really changed. The same is true for nuclear energy after Fukushima, nothing really changed on the factual basis. The risk is the same as before the accident, because the accident did not reveal any important new information about the nuclear energy production process. Still the accident triggered massive attention. Therefore it is probable that also media risk coverage is varying over time and comes and goes in phases. If an accident, detriment, or other events triggers attention to a risk, it will more probably be covered by the media—at least, more than in times when nothing is happening. This was something also Wessler (1999) was able to show in his analysis of the public sphere as a process. His analysis of a drug debate in Germany from 1988 to 1995 shows phases of low attention and high attention which are affected by events (Weßler, 1999, 79; 155). Therefore, the thesis is posed here that risk and risk coverage is due to attention phases the same or similar to those described by Downs (Downs, 1972). It is however not expected that all risk issues will be due to a cycle, which implies a repeating and never ending attention process much rather the concept of phases will be implemented. This is also something Newig (2004) (see also Newig & Hesselmann, 2004) discusses in his work on issue attention cycles. In his concept, an issue does not have to

drop down to the bottom line of zero attention. It can stay on a low level of attention and might also rise and fall and create smaller peaks if for example as Newig points out, new facts become accessible (2004, p. 158). Newig suggests an actor-based attention model to answer the question of when and why issues receive public attention (2004, p. 161) and gives special interest to four actor groups, being the citizens, mass media, politicians and special-interest groups (2004, pp. 162–163). In the five phases that Newig describes the first one is a stage in which “public attention is scarce” (Newig, 2004, p. 166). Citizens are ignoring the issue at this stage because it is “costly” to involve in issues and at this point in time the benefit of giving the issue attention is low (Newig, 2004, p. 166). As however when the “environmental condition” and “availability of problem-solving resources” improves, the issue can gain attention and can start its cycle. In order for the issue to be able to develop, knowledge has to be provided about it. At this stage actors that know about the issue, for example experts and scientists, have to spread what they know about it. If this is successful, attention will rise in exponential manner, according to Newig (2004, p. 16). At this stage media and interpersonal communication is taking place and the more communication is taking place the more individuals will feel concerned about the issue. As of when the attention starts to decline Newig suggests two possible ways. The first one is if politicians are not able to solve the problem, citizens will sooner or later start to turn away from the issue. At this point there might also be other issues of interest that distract and drag attention away (2004, p. 17). If however the issue and the problem are so severe that citizens or other actors put much pressure on the political system, politicians will be forced to act in some way or the other, depending on the complexity of actually solving the problem. Newig claims that in both cases attention to the issue will decline and if the issue remains unsolved, as Luhmann (1971) he also argues that the issue will have to start a new cycle. After once being in the attention cycle, an issue will have a lowered threshold to enter into it again. Newig mention the previous history of issues (2004, p. 168). As have Newig (2004) used his phase or stage model to describe attention to issues like the BSE, the dying forest (in German “Waldsterben”) and summer smog, so have also several other scientists used this concept initiated by Downs (1972) and Luhmann (1971). Before this study suggests a phase model for risk communication, some of those other studies dealing with these concepts shall be described in order to win a broader knowledge of the concept.

Scientists have used Downs’ model as it stands and others have proposed similar phase models, which also aim to describe the dynamics of attention directed to different issues over time. It is however not only the three characteristics of the issue (concerning a certain amount of the population; containing benefits for some and suffering for others; amount of excitement) itself mentioned by Downs (1972, p. 41) that makes an issue

enter into the issue attention cycle. As we have seen, Newig (2004) puts actors in focus. Several other scientists suggest further influencing factors of the event itself, how it is reported by the media or of the general context it occurs in, to closer specify how and why issues are due to attention phases. In the following part of this chapter studies that have shown different additional influencing factors are to be discussed.

Brossard, Shanahan and McComas (2004) were able to show that the culture of a country as well as the journalistic culture and routine have influence on the career of an issue. They compared American and French newspaper (*New York Times* and *Le Monde*) coverage of climate change over a time period of ten years (1987-1997) (Brossard et al., 2004, p. 366) and showed that the French coverage of climate change was less cyclical than the American and that it was rather tied to political events connected to climate change, something that also Schmidt et al. (2013) confirmed in their study of media attention to climate change in 26 different countries from 1996 to 2010. According to Schmidt et al., climate change triggered increasing media attention starting from mid-2000 and attention peaks are tightly connected to international events and developments (Schmidt et al., 2013). Brossard et al. (2004) conclude that the issue attention cycle as proposed by Downs (1972) might have to be considered to be describing American media coverage of environmental issues, as these were the issues Downs used in his approach (Brossard et al., 2004, pp. 373–374). Brossard, Shanahan and McComas (2004) are not the only ones to consider a wider context to have impact on an issue attention cycle.

Nisbet and Huye (2006) also consider a wider context in their study in which they show that the topic of plant biotechnology also conforms to Downs' hypothesis about issue attention happening in cycles. In their study, they analyzed coverage of plant biotechnology in the *New York Times* and *Washington Post* from 1978 to 2004. They discovered that the issue of plant biotechnology was an unnoticed issue for many years until there was a triggering event that caught attention. In this case, the triggering event was a social protest and a published scientific study, which peaked in high media attention (Nisbet & Huye, 2006, 3; 31) until it, during the next stage, began to slowly slip down the attention ladder (Nisbet & Huye, 2006, p. 22). However, the authors go beyond looking at phases due to the amount of coverage and are interested in the role of the "social mechanisms" that influence the phases and the cycles. Thus, they include "the type of policy arena where debate takes place, the media lobbying activities of strategic actors, the journalistic need for narrative structure, and the competition from other issues for attention across policy and media environments" (Nisbet & Huye, 2006,

p. 1).²⁰ The inclusion of development on the issue on the political level makes sense considering that the media agenda and the policy agenda show influences on each other that are reciprocal. There is not one direction of influence, but those agendas are, to varying degrees, influenced by each other (Van Aelst, Thesen, Walgrave, & Vliegenthart, 2014, p. 214). Nisbet and Huge connect the political sphere, combining it with the content analysis looking at, for example, journalistic frames (Nisbet & Huge, 2006, p. 18). They discovered that even though there was a period of key events between the late eighties to the late nineties, the media attention remained on a low level (Nisbet & Huge, 2006, p. 22). As the so-called Monarch study was released, journalists started to report on the risks that could derive from plant biotechnology. Even if the issue did get higher attention after this, the issue never received the massive attention in the US as it did in Europe. This is, according to the authors, probably due to political decisions in the early days of the technology in the US and a mostly technical framing of the issue that somehow gave a “policy monopoly” to the issue. Compared to other issues, Nisbet and Huge mention the example of stem cell research; plant biotechnology never got as much attention. This, as well as other issues, might have ruled out biotechnology and this shows the importance of also considering the factor of issue competition (Nisbet & Huge, 2006, 23; 32-33). Nisbet and Huge’s study shows clearly that issues do not exist in a vacuum where only the issue or triggering event itself decides if it will raise attention or not. The context in which it occurs, the political state it falls into, and how it is presented by journalists influence the attention it gets.

Schäfer (2007; 2009) investigated the medialization of three scientific issues over time and concluded that those issues were also occurring in a phase pattern. The scientific issues Schäfer analyzed in German print media, were stem cell research, the human genome project, and the issue neutrino research. In his long-term study reaching from 1994 (1997 for stem cell research) to 2003, he found that those scientific issues, which could at the same time be defined as risks, are medialized to different degrees. Schäfer combined the analysis of the extent of coverage—how much attention were given to the issues over time, with the investigation whether actors and content got more pluralized, and if the issues were presented controversially by the media. This combined analysis of amount of coverage with contextual factors lead Schäfer to conclude differences between the issues, and their medialization phase pattern. The issue of neutrino research was only covered to a very low extend and Schäfer (2007) conclude that the issue was not in an issue attention cycle (Downs 1972). For the other two issues however, the media attention to them is, together with contextual events, peaking several times and

²⁰ For a discussion of competing issues see for example Zhu (1992).

Schäfer divide the media coverage into four phases: the early stage, the latency stage, the main stage and the late stage. Interestingly Schäfer (2007) found differences in the way media would cover those issues across these four phases. If concentrating on the stem cell issue, some interesting results shall be emphasized. In the early stage the issue was covered in the scientific desk of the newspapers and then transferred to the political desk in the latency and main stages only to end up to in the feuilleton desk in the late stage. Regarding the actors cited in the coverage, the main actors were scientists in the two first stages and following politicians were mainly cited in the two latter stages. Regarding statements, so where most statements neutral, and when there was a bias it was mostly positive, but with a pattern of increasing negativity across time. Regarding the framing of the issue, it was across the years mainly framed as a scientific issue and a political issue (Schäfer, 2007, p. 167). This result is interesting when compared to the main topic and main actors of nuclear energy. As this study will discuss later, nuclear energy is mainly covered as a political issue. In the comparison to the issue of stem cell research is interesting to see that this mainly has scientific frame, but mainly political actors speaking during the main stage. Because the issue can also be defined as a risk, this shows that different risks are covered differently and it would be highly interesting to see, when/if the technology becomes used more frequently, if the media presentation of it changes. Concluding Schäfer's (2007; 2009) findings regarding the phases identified, the study shows that different (scientific) issues are covered somewhat differently in different phases.

The perspective of how issues are presented by the journalists is the focus on **McComas and Shanahan's (1999)** study. They use Downs (1972) issue attention cycle and combines its phases due to article frequency with the journalistic presentation of an issue. They focus on the journalistic narration in general (McComas & Shanahan, 1999, p. 30) and more specifically on the "metanarratives" that through topic developments are constructed over time (McComas & Shanahan, 1999, p. 37). The topics of media coverage create a story and give meaning to an issue (Köhler, 2009, p. 53). They analyzed 376 articles on global climate change in two US-American newspapers: *The New York Times* and *The Washington Post* over the years 1980 to 1995. In their analysis they observe a cyclical pattern of attention to global climate change on a newspaper article frequency level. And in addition they did also find patterns on the level of metanarratives, which were constructed by the dominant topic of articles and also by the mentioned global climate change consequences (McComas & Shanahan, 1999, p. 40). They found out that topics were dominating to different degrees during the different phases of the attention cycle. Similar to Henry and Gordon in their issue attention model (2001, p. 169), they also distinguish three phases: first the *waxing* phase/rise phase, secondly the *maintenance* phase/peak phase and third the *waning* phase/fall phase. They did ob-

serve that “dangers and consequences of global climate change were significantly more prominent in stories during the period of increased newspaper attention” (McComas & Shanahan, 1999, p. 49). In the maintenance phase scientific controversies as well as economics were due to more attention (McComas & Shanahan, 1999, pp. 49–50) and the economics of how to deal with climate change was also due to attention in the waning phase (McComas & Shanahan, 1999, 30, 47). This again shows that phases can be observed not only in the degree of attention, but also in the content, and the way in which the issue is presented by journalists. Content factors like topics, actors who are speaking as well as the political and social context are dimensions that Eisner et al. (Eisner, Graf, & Moser, 2003) also focused upon additionally to article frequency.

Eisner, Graf and Moser (Eisner et al., 2003, p. 17) also deal with the question of why medial discussions about environmental and technological consequences tend to have the shape of waves. They propose a model to describe the emergence and processing of issues and aim to develop general explanations for this (Eisner, 2003, p. 23), which instead of the five phases of Downs (1972) contain four phases. To describe and distinguish those phases the authors take use of occurring actors as well as also interpretation patterns in the media coverage. The phases they describe are by the author of this study translated from German to English to be the *latency phase*, the *escalation phase*, the *culmination phase* and the *normalizing phase* (Eisner, 2003, p. 43). Similar to Downs’ (1972) pre-problem stage, an issue in the latency phase of Eisner et al. is said to only interest smaller groups of society, like experts or political activist groups. Those groups might try to draw attention to their issue of interest, but are in most cases not successful. First, when certain factors are fulfilled, an issue will get attention and enter into the escalation phase. Those factors, according to Eisner, can be promoting actors that use organisational, temporal, economical or scientific means to promote issues; they could be the development of interpretations of the issue that shows the importance of the issue to members of society; as well as events that demonstrate the importance of the issue. In the culmination phase the limitation of attention of promoters, media and politics break down and let the attention culminate before it then decreases. This is the phase in which the issue has reached its largest societal relevance and during which scandalising, mobilising of the public and the articulation of demands are common. This is also the time where political activities, like law proposals, establishing of working commissions and presentation of political parties’ standing points, are most probable to be initiated and focused. In this phase also scientifically expertise will become important because more information is needed. Institutionalization and scientific detriment observation of the issue can be signs suggesting that the issue is entering into the normalizing phase. If political instances are dealing with the issue, this can be one of the reasons attention is decreasing, as the issue is being dealt with or perceived as taken care of. Also the simple

fact that the attention by the public and the media cannot last forever and other issues will become more newsworthy is additionally a reason for the normalization phase to set in (Eisner, 2003, pp. 43–45). In two of Eisner et al.'s (2003) case studies in which they test their model, they deal with the issue of nuclear energy. Both studies deal with the Swiss newspaper coverage of nuclear power over time spans reaching from 1969 to 1985 ($n = 8270$, 486 articles per year²¹) (Graf, 2003) and 1986 to 1990 ($n = 4475$, 895 articles per year) (Moser, 2003b). In Graf's case study she analyzes which actors were present in the discourse of nuclear energy in Switzerland, because as she argues, *who* speaks will influence *how* the communication looks (2003, p. 126). She identified three actor groups: problem promoters (in favor of nuclear energy), the opposition and the state as an addressee, those were either arguing in favor or against nuclear energy (Graf, 2003, pp. 127–130). Inside of those groups she identified the specific actors and with which arguments they connected to. However, her study does not show if or how this changed over time. More interesting in her study is the data depicting how the discourse developed over those 16 years. As she concludes the topic was intensively dealt with over a long time, as the three newspapers all together published around 500 articles on nuclear energy per year. This was due to many conflicts taking place in this time span. There were many protests and political initiatives going on as well as one nuclear accident, the one of Three Mile Island in the USA (Graf, 2003, p. 131). The data enables the division into four phases. The latency phase lasted from 1969 to 1974 and was marked by a juridical conflict that did not receive great attention. The two first nuclear power plants of Switzerland were taken into usage without problems in this phase. The root of the controversial conflict that was going on, on a low level, were the plans for the nuclear power plant Kaiseraugst. In general the topic was discussed if the water cooling process would lead to too warm water in the rivers. This, from the opposing side of nuclear energy, gave the discourse an environmentalism touch (Graf, 2003, pp. 134–135). The nuclear energy favoring side however gave the issue the stance of a threatening energy crisis and shortage, which would in the long run cause unemployment. Also the dependency on other countries for energy and oil delivering was a prominent argument (Graf, 2003, pp. 136–137). The Federal Council of Switzerland solved the problem of the cooling water with a ban of using river water for this process, and instead cooling towers should be foreseen. But this was not enough, the population in the region Kaiseraugst were not only concerned about climate change, but they in addition felt excluded from the decision process as the population was not included in the decision on if their municipality were to be considered for a nuclear site (Graf, 2003, p. 138). This

²¹ Both case studies analyze three Swiss newspapers, those being NZZ, Tages-Anzeiger and Blick (Eisner et al. (2003, p. 86)).

opinion climate, which seemed full of conflicts that could become larger anytime, was the basis on which the issue entered into the next phase. The escalation phase was shorter, lasting from 1975 to 1978 (Graf, 2003, p. 134) and was embossed by intense and partly violent protest with origins in Kaiseraugst, which now however also escalated on a national level. The newspapers covered those protests closely (Graf, 2003, p. 139). However, the political initiative which would have given local communities the right to have their saying in the matter of if to build a nuclear site in their region or not, was rejected in a referendum in February 1979 with 51.2 percent (Graf, 2003, p. 144). However, only one month after this decision, the accident on Three Mile Island happened and let the opinion landscape change again. The culmination phase from 1979 to 1983 (Graf, 2003, p. 134) was colored by the nuclear accident in the US and the question was asked if an accident like that could happen in Switzerland as well. The potential detriments and the safety of nuclear energy plants were due to discussion and the debate on Kaiseraugst was still ongoing. The issue of the question of where to store the nuclear waste became an often discussed issue in this time as well (Graf, 2003, pp. 144–147). In the normalizing phase lasting from 1984 to 1985 (Graf, 2003, p. 134) another issue caught the attention. In this time period the dying forest was a large issue that was due to much media attention and political discussion in Switzerland. The nuclear issue was again put into new light as it was now considered to be a clean energy source, which could help solving the problem of the dying forest. In this time period further nuclear energy referenda were held. Hence, because of the more important issue of the dying forest, the opinion climate was rather in favor of nuclear energy. But even though the population was rather in favor of nuclear energy, they were still against the plant of Kaiseraugst (Graf, 2003, pp. 148–149). Graf concludes that the interest of the media and the public seem to fade as soon as important political decision have been made (Graf, 2003, p. 133). Nuclear energy is clearly a highly ambivalent issue. It has been argued to cause environmental problems as well as being a solution to solve them. It is a technology that is generally quite accepted, but in the case of Kaiseraugst became a very sore point. People wanted to be part of the decision taking. Other than that, when an accident happens, the probability of something happening in the own nuclear energy plants becomes highly salient and this can trigger a slight revising of opinions, that however did not seem to last very long in this time period.

Where Graf's study ends, Moser's takes on. He claims the nuclear energy debate to have arrived at a deadlock in 1985, that was shortly before the, at that time, most severe nuclear accident happened. The discussion was highly polarized, but neither the nuclear energy favoring nor the opposing sides were able to change the situation (Moser, 2003b, p. 183). What the severe accident in Chernobyl 1986 changed about the situation is what Moser analyzes in his study. To realize how heavily covered this event was by the

media, he compares the monthly change in article number after Chernobyl to after the accident on Three Mile Island. Back in 1979 the number of news articles doubled after the accident compared to the month before the accident took place. But after Chernobyl, there were sixteen times more articles in the month after the accident, compared to the month before it happened. Moser concludes that Chernobyl was a media event to a very high degree. The so called “Chernobyl-effect” was immediately visible in the political system, which began to deal with the question of a nuclear phase-out. Moser considers the peak in media attention after Chernobyl, 1986-1988, to be a second phase of culmination after the one Graf (2003) analyzed. Therefore, the issue entered into the culmination phase without the preceding phases of latency and escalation phase. The re-entry into the normalizing phase happened as the bourgeois parties decided not to build Kaiseraugst and finally put an end to the Kaiseraugst conflict. The accepted moratorium in 1990 was also something that let the issue slide into the normalizing phase, because it also put a (temporal) end to the discussion of nuclear energy (Moser, 2003b, pp. 186–187). Looking closer at the media coverage of the Chernobyl accident, Moser (2003a) claims that the media coverage was not very dramatic. The accident happened relatively far away from Switzerland and there were not much information available. According to Moser, this might have been one reason for the rather political discussion of nuclear energy that followed shortly after the accident and was also depicted in news media. The two newspapers *NZZ* and *Tages-Anzeiger* were clearly representing their point of views on nuclear energy. *NZZ* argued that it was not surprising an accident like that happening in a planned economy state like the Soviet Union where safety standards are not the same as in western countries, whereas *Tages-Anzeiger* argued the risk of nuclear energy is the same independently of where the nuclear plant stands. Obviously the accident immediately influenced political parties, as some of them articulated a nuclear phase-out, only a few days after the accident became known. Already in mid-June, the Federal Councils discussed the matter (Moser, 2003b, pp. 190–192). However, with the moratorium as the result of all this, Moser speaks about a “non-decision” situation. Kaiseraugst was decided not to be built, but with the moratorium the status quo was more or less kept. What the media coverage of Chernobyl changed, was the acceptance of nuclear energy. In the dead-end situation of before the accident, this was the icing of the cake that brought at least some movement into the situation, even though it did not really change much and allowed for the nuclear energy discussion to fall asleep in the nineties (Moser, 2003b, pp. 210–211). As these two case studies show and the authors also discuss, the success of an issue in the media and politic is due to an interaction between four processes. Those are the developments of problem promoters and their mobilization of organizational resources, the opportunity structure of society at a certain point in time as well as self-amplifying interactions between subsystems of society (Eisner &

Moser, 2003, p. 242). As those aspects are also the factors the authors use to divide the media coverage into phases, their phase division are constructed with the help of the content of the media coverage as well as the interplay with and of societal and political movements and events and degree of media attention. Considering Downs (1972) phases and connecting them with aspects of content discussed by those different authors, it seems sensible to take more aspects than only the amount of media coverage into account when looking at attention phases and wanting to understand why attention rises and disappears. This is something Kolb (2005, 2014) also does in his work. Just like Downs (1972), Kolb in his work relies on five phases, but calls them differently than Downs does (Kolb 2005: 80–84). He criticizes previous phase model studies because, so he claims, some tend to almost only concentrate on the dynamic of the coverage without considering the content of the discourse and others concentrate too strong on the content without considering the dynamic (Kolb, 2014, p. 13). This is an important aspect to take into account. Kolb tries to help this issue by suggesting a model which phase divisions relies mainly on “mathematical curve discussion” and statistical data, but also considers the content of the coverage (Kolb, 2014, p. 33). To first estimate where phase borders are to be drawn Kolb applies a normal curve of distribution of the number of articles. With this curve he identifies turning points in the coverage (Kolb, 2014, pp. 24–30). In a second step he turns to the content and analyzes which are topics of the coverage, for example if the topic is being dealt with from a political perspective, which actors are speaking and which arguments are brought forward, which events are covered (also triggering key events), in the case of risk communication if there is a focus on the detriment or the benefit, and if there is a certain general tendency (i.e. pro or contra nuclear energy) or frames to be identified, which would confirm the turning points and the phase division (Kolb, 2005, p. 119, 2014, pp. 30–31). A pilot study on nuclear energy coverage in Switzerland²² showed that the division into phases according to Kolb’s mathematical curve theory combined with content aspects was ambivalent because of the dramatic impact Fukushima had on the increase in coverage. With such a triggering event there was no slow increase in coverage, but rather an explosion and a curve slowly decreasing, but showing several smaller peaks occurring after the climax. The phases that were possible to divide with only looking at the amount of coverage and turning points, could not clearly be recognised in differences in the content (Huber, 2015, pp. 87–88).

²² The Master Thesis of Clara Hueber in Prof. Mike S. Schäfer’s department at the Institute of Mass Communication and Media Research at the University of Zurich analyzed two dailies *NZZ* and *Tages-Anzeiger*, as well as two weekly magazines *Die Weltwoche* and *Die Wochenzeitung* during the 1st October 2010 to the 30th September 2012 Huber (2015, p. 43)).

Table 2 Overview of Issue Attention Phase Models

Issue Attention Phase Models						
Five Phase Studies						
Downs 1972	Pre-Problem	Alarmed Discovery & Euphoric Enthusiasm	Realizing the Cost of Significant Progress	Gradual Decline of Intense Public Inter- est	Post- Problem	
Newig 2004	Scarce Pub- lic Attention	Availability of Problem- Solving Resources	Accessibility of the Prob- lem	Fast Selling Item	Attention Decrease	
Kolb 2005	Latency Phase	Upswing Phase	Establishing Phase	Downswing Phase	Marginaliza- tion Phase	
Four Phase Studies						
Eisner et al. 2003	Latency Phase	Escalation Phase	Culmination Phase	Normalizing Phase		
Schäfer 2007	Early stage	Latency stage	Main stage	Late stage		
Three Phase Studies						
McComas/Shanahan 1999	Waxing Phase	Maintenance Phase		Waning Phase		
Henry/Gordon 2001	Rise Phase	Peak Phase		Fall Phase		
Policy Cylce Phases						
Jarren/Donges 2011	Problem Articula- tion	Problem Definition	Policy Definition	Program Devel- opment	Imple- menta- tion	Evalua- tion
Note. The phase names of Kolb 2005 and Jarren & Donges 2011 have been translated from German to English by the author of this study.						

When the interest lies on risk and if or why risks vary in attention levels an important aspects, as also mentioned by some of the previously discussed studies, is the aspect of triggering events (see for example Eisner et al., 2003; Waldherr, 2012, pp. 21–22). Especially if a detriment occurs seldom, but has high severity, the relevance of a triggering event becomes obvious.

A study that combines the notion of triggering events with Downs' (1972) model is the study of Petersen (2009). Petersen (2009) also analyzes an attention cycle due to a triggering event. She also uses the concept of Downs (1972) but revises its phases. She applies the concept to a non-domestic issue, the one of international terrorism in order to understand and explain the relationship between policymakers and the public as well as the public support to failed foreign policies (Petersen, 2009, p. 1). Petersen argues that

the five stages of the issue attention cycle can be applied to the issue of international terrorism, as there was an elite dealing with the issue also before 9/11 terror attacks, which was a trigger event that brought the issue into the attention cycle of the greater public (Petersen, 2009, pp. 3–5). The terror attack of 9/11 in New York City of course triggered a very intense media coverage of the event as Petersen's data show, which slowly declined, but experienced several re-triggering events like the terror attacks in London and Madrid, which brought smaller spikes to the media attention (Petersen, 2009, p. 9). Petersen proposes a modification to the model's third stage. When the realization of the costs of solving a problem, she argues that the possible asymmetry of understanding should be considered. Everyone might not have the same level of understanding the problem. The author argues that with all information sources we have access to today, there will not be a lack of general information, but there might rather be a lack of understanding amongst people. The lack of understanding leads to less interest in the topic, so the issue might enter into the fourth stage directly without realizing the cost in stage three. With a population not realizing the cost of the solution to the problem, the issue can be reused by policy makers and the issue can start to cycle between stage two and stage four (Petersen, 2009, pp. 10–11). With providing enough information and understanding of the issue, the issue of international terrorism could be brought out of the issue attention cycle and this might apply to other issues as well. Petersen points to the example of global warming and the public shift from seeing the issue as an important one which should be dealt with even if this means costs to the public. In this case the education on the issue has brought understanding to it (Petersen, 2009, p. 13). This study together with Eisner et al. (2003) demonstrates that Downs's concept might need some modifications on the level of phases. As Eisner et al. showed, an issue can be brought out of the cycle as when there is a perception of a political solution of the problem (Graf, 2003, p. 133). Petersen, on the other hand, argues that the degree of understanding the issue might lead to an end of the attention cycle (Petersen, 2009). In the research overview on this field given by Waldherr (2012, 2014), the initial five phases of Downs (1972) are again collapsed into four. Similarly to Eisner et al. (2003) Waldherr also discusses the *latency* phase which responds to Downs pre-problem stage. Second is the phase of *breakthrough* which often is entered because of a trigger event as touched upon above. The third stage is the phase of *boom*, so Waldherr, where the issue becomes high attention. The last phase is the one of *fatigue*, in which the topic is worn out and slowly fades (Waldherr, 2014, p. 853). Independently of the exact naming of the phases and if they are five or rather four, it is important to reflect what makes the distinction between them possible. One way to divide the pre-problem phase from the phase in which the attention rises is through the high amount of media coverage that often is triggered by a key event. Since this point in the attention cycle is

of such high importance to the issue, the research that deals with this specific concept, being key event and triggering events, is to be discussed and looked closer upon. As mentioned, those dramatic events are important especially for risk issues, because they enable the discussion of several risk dimensions. Without such events it is not probable that all risk dimensions, such as detriment, will be discussed by the media. Key events might be crucial when asking the question regarding if there is a phase pattern to risk coverage. There is a body of research which investigate the effect of such events on media attention and coverage. This research will be discussed next. They give several additional clues that are important to phase models because they show how to identify a trigger event and what such an event might change in the “nature” of the media coverage. Since a trigger event is considered to many times let an issue enter into an attention cycle, transferring it from the latency phase to the phase of high attention, the research on this concept become valuable and should be considered for the, to be suggested, Risk Attention Phase Model.

5.1. The Role of Events to Media Attention

Before starting a discussion on what triggering or key events are and what they evoke, it should first be introduced what an event is, and how it is to be distinguished from a topic or issue.

Imagining a newspaper article published two weeks after the nuclear accident in Fukushima provides an example that explains the difference between a topic, an issue and an event. The topic of the article can be identified as *energy production*. The category of energy production contains different ways of producing energy like wind energy, nuclear energy, water energy, etc. According to the German communication scientist Kepplinger (2011, p. 70), topics mostly do not have identifiable starting and ending points²³, which distinguishes topics from events. An event is an incident or occurrence that is temporarily and spatially restricted so that a beginning and ending can be identified. An event could, for example, be an *accident* (Kepplinger, 2011, p. 67) and in our hypothetical newspaper article, the event could be the *nuclear accident* in Fukushima, which started at a certain point and somehow also can be seen as having had an ending. However, events and topics are connected to each other. Events can be related to one or more topics. The nuclear accident in Fukushima is an event related to the topic of nuclear energy production. And the other way around, the accident in Fukushima could be related to the topic of accidents in general or nuclear accidents more specifically.

²³ Although topics are sometimes restricted temporarily and spatial Kepplinger (2011, pp. 70–71) like for example if one would speak about all traffic accidents between 1990 and 2000 in Switzerland.

The article also possibly covers an issue. The issue in this hypothetical case could be the *political discussion of nuclear energy production*, an issue being a topic that is controversially discussed. “An issue is a conflict between two or more identifiable groups over procedural or substantive matters relating to the distribution of positions and resources” (Cobb & Elder, 1983, p. 82). Nuclear energy is due to an ongoing political discussion and can be seen as an issue that society is debating. This newspaper article could be categorised as dealing with the topic of energy production, covering the issue of nuclear energy production and might have been added to the media agenda because of the event of the nuclear accident in Fukushima.

Scientists, and I shall mainly speak about communication scientists²⁴, go a step further and define “key events”. A key event is an outstanding incident, which, according to the German communication scientist Esser, evokes intense media coverage (Esser, 2011, p. 45). Rauchenzauner defines a key event as a unique event, which contains a new circumstance or has a particular wide reach. This event can be a negative one, but also a positive one. What makes it a key event is its extraordinariness (Rauchenzauner, 2008, p. 21) and the ability to draw intense media attention to itself (Rauchenzauner, 2008, p. 179). Defined by the German communication scientists Brosius and Eps (1995, p. 393) and Kepplinger (2011, p. 86) a key event is an occurrence, which is intensively covered by the mass media. According to Brosius and Eps (1995, p. 393) and Kepplinger and Hartung (1995, p. 21) a key event is often a severe catastrophe or accident that sticks out because it signals danger or cause damage. But Brosius, Eps (1995, p. 407) and Kepplinger (2011, p. 86) all point out that there are no objective criteria to define events as key events; by looking only at the event itself. Therefore, a key event in this perspective is defined as such by the heavy media coverage that follows it. There is a contradiction between these two definitions. Esser (2011) and Rauchenzauner (2008) lay more importance on the event itself being outstanding in some way and therefore object of intense media coverage. Brosius, Eps (1995) and Kepplinger (2011) point to the difficulty to identify events by the events themselves and instead identify key events by the intense media coverage of the event. With this distinction we have opened two different drawers: the one containing research that rather tries to answer the question *if* events are reported (Rauchenzauner, 2008, p. 28) and therefore trying to define the characteristics an event must have (for example which news factors) to become a key event. In social sciences this is rather an objectivistic point of view, which defines the success of social issues by the objective measurable factors like number of affected humans, the severity of damages etc. (Schetsche, 2008, p. 30). The second drawer of

²⁴ Later in this chapter, we shall see, that it is not only communication scientists who deal with key events.

research rather asks the question *how* key events are reported (Rauchenzauner, 2008, p. 28), which rather focuses on the intense media coverage of the events and how they are *turned into* key events²⁵. This perspective is one of constructionists that argue that social problems or issues are defined by society, or in this case the mass media, itself and not by the event, problem or the issue itself (Schetsche, 2008, p. 30). The interesting discussion of objectivism, constructivism and the question if it is the outstanding nature of the event that triggers massive media coverage and which characteristic this event might have or if the event is more or less any (mostly negative) event, which is turned into a key event by the media, is, however, not objective of a deeper discussion here. Rather, this study is interested to see how the media treat an event that objectively is an important event, if not for society as a whole, then at least for the process of energy production using nuclear energy, and how this event takes expression in the immediate and following media coverage and how the media coverage of nuclear energy might change after the event. Moreover, the concept of a key event is of high relevance to the previous discussion of attention cycles and will have importance to the following phase attention model for risk communication. A key event can trigger a change in attention phase patterns. For some issues, a key event might be crucial for attention being directed to the issue at all. For risks, which have a high beneficial degree and a low probability of detriment, a key event might be the trigger which recalls the detrimental side of the risk. Without this trigger media might cover the risk in mainly its beneficial aspects. Such different focuses might well be identifiable as risk attention phases.

The term key event is however not the only term used to describe events that trigger extensive media coverage. There are several similar concepts to be found in the communication science research as well as also a similar concept called focusing event that derives out from political science research. The approach of *focusing events* is in political science used to identify political changes due to key or trigger events. In this approach, the politicians, instead of the media, are considered to have an active role (Weiß et al., 2014, p. 81). Several scientists use this approach. For example, the political scientist Birkland uses focusing events to analyze how focusing events influence social and political spheres (Birkland, 1998, p. 54). According to Birkland, “A focusing event is an event that is sudden; relatively uncommon; can be reasonably defined as harmful or revealing the possibility of potentially greater future harms; has harms that are concentrated in a particular geographical area or community of interest; and that is known to policy makers and the public simultaneously” (Birkland, 1998, p. 54). The event perception is similar to that of the key event and media-hype, (which will be described in

²⁵ For a similar and short discussion on the distinction of these research approaches see also Weiß, Markutzyk, and Schwotzer (2014, pp. 80–81).

the following); however, the focus lies on the push that events can give on the political level. The political scientist Kingdon points out that there are problems that are not always self-evident but they can do with a little push to get the attention of the society. This push, as he argues, is sometimes provided by focusing events, which can be crises or disasters (Kingdon, 2003, p. 94). This push becomes especially interesting when looking at nuclear power. Since severe accidents in nuclear power plants seldom happen, the risk tends to be forgotten by the general public when nothing happens. A nuclear accident can be seen as this push that Kingdon speaks of and make out for a key or focusing event, if it is dramatic enough. Birkland points out that focusing events are sudden and cause immediate and obvious harm and this puts more pressure on the political agenda to act. He analyzes the example of the nuclear accident in Three Mile Island, which even though it was rated with a five on the INES scale, did not have big influence on the political agenda. Birkland argues this was because the harm it caused was not obvious, if even existing at all (Birkland, 1998, pp. 54–55). Why focusing events are seen as important, as Birkland argues, is because they can be the trigger which opens the policy window (Birkland, 2004, p. 181). “Focusing events focus the attention of scholars, as well as of policy makers and citizens” (Birkland (2013, p. 367). If an event becomes a focusing event, the effects it can have is to lead the attention of different actors of society, like interest groups, politicians, the general public, including news media, to new or existing but dormant problems. The attention can lead to a search for solutions to these problems (Birkland, (1998, p. 55). He points out that focusing events can be useful for disadvantaged groups and can give them a chance to seek policy change in topics that might have been dormant before (Birkland, 1998, p. 54).

Coming back to communication science, there are several similar concepts to key events. The terms key event and trigger event, are more or less used similarly in those approaches. According to different research agendas, those events trigger *media hypes* (Elmelund-Præstekær & Wien, 2008; see for example Vasterman, 2005; Wien & Elmelund-Præstekær, 2009), *news waves* (Esser, 2011) or *media storms* (Boydston, Hardy, & Walgrave, 2014). Those research approaches use the term in order to identify a starting point for following extensive media coverage. Vasterman (2005), who is said by Elmelund-Præstekær and Wien (2008, p. 249) to be a pioneer in research on media hypes, defines key events as an event that is given much media attention because the event itself is somehow special or because it occurs on a slow news day. According to him, this event does not have to be shocking or severe (Vasterman, 2005, p. 513). This implies that becoming a key event either depends on the particularity of the event itself or on the context in which it happens to occur. In saying that a key event is “an event that receives more attention than comparable events, for whatever reason” (Vasterman, 2005, p. 516). He defines media-hype as a media constructed news wave occurring in

all media which rises after a trigger event and grows larger as a consequence of a media self-reinforcing process (Vasterman, 2005, 515; 522). And he concludes that “to be considered a media-hype [...] a news wave conforms at least to the following criteria: a key event; a consonant news wave; a sudden increase in reports on comparable cases; and a strong rise of thematically related news” (Vasterman, 2005, p. 516). Wien and Elmelund-Præstekær also use the concept of key event in their research on media-hypes, but they deliberately choose the term *trigger event* instead because it rather implicates a starting point of something and also because it does not imply the event to be the most important part, the key, of the media hype (Wien & Elmelund-Præstekær, 2009, p. 187). To Boydston et al. (2014) a media storm, which is a sudden and high media attention, is also due to a specific event. Common for these definitions is that key events or trigger events are starting points of particularly intense media coverage. In order to be able to get that much media attention, something has to be special about the event itself, or the time it occurs in or how in the way it is reported by the media. But those events do not only trigger extensive media coverage, they are also to some degrees able to change media coverage. Those specific changes that communication scientists have identified will be compiled out of the following brief research review of the field of key event and media-hype.

5.2. Media Reality – Key Event and Media-Hype Studies

In this chapter studies will be presented and discussed which analyze *how* a key event influences media coverage. Some of the earlier work did not yet use the concrete term key or trigger event directly, but did however analyze how media treat key events and which effects this has on different levels.

A much cited early study was conducted in 1978 the American criminologist Mark **Fishman**: “Crime Waves as Ideology”. Thereby a crime wave is increased media coverage of some sort of crime. Particular with this news wave is that it is a media product. The accumulation of crime is not visible in the crime statistic, but still there is a crime wave in the coverage of different media. Fishman analyzes how news organizations construct crime waves and try to answer the question why they do so. In his study he concentrated on crime against elderly and his empirical analysis was made on New York media and crime statistics (Fishman, 1978, p. 533). Looking at the news making process in editorial offices, he discovered that the chance of an event to make it into the news increases as it can be associated to a current topic in the news (Fishman, 1978, p. 535). He also discovered that the media reported crime stories against elderly more often after the wave, than they had done before the wave. He argues, the wave of crime coverage had sensitised the media itself to the topic (Fishman, 1978, p. 533) and the

different media he analyzed seems to have been triggering each other to bring up the topic again after having abandoned it while covering something else (Fishman, 1978, p. 534). There will be no wave without the triggering and interaction of several news organizations (Fishman, p. 537). Fishman concludes, some news became news because of what was going on inside the news room and not because what was going on outside the newsroom (Fishman, 1978, p. 536). However the news wave does not only open the door for other crime stories. As soon as the wave is rolling²⁶, journalists not only cover the *event* and similar events, but also the reactions of officials, like politicians to the event (Fishman, 1978, p. 540). The wave put pressure on politicians to deal with the issue and it also opens up for a political discourse on the topic. Taking this one step further it could be claimed that if a journalist wants to start a discourse on political and societal level, he could try to create a news wave in order to trigger a discourse in the society. Saying this, without aiming to get into the discussion of power behind media topics, it should be mentioned what Fishman points out in his article, that the journalists get their information on the crimes happening not from walking down the street and witnessing them, but from the police wire (Fishman, 1978, p. 540). Theoretically the police can decide which topics to “feed” the journalists (Fishman, 1978, p. 542). As Fishman discovered, the issue of crime against elderly became the favorite issue of politicians’ rhetoric and reforms (Fishman, 1978, p. 540) and the politicians taking the issue seriously only triggered the wave even more, in the sense of “if they take it seriously, then it must really be real”. There were two phases to make out in the wave, the first one being coverage of the problem itself followed by the second phase on what is being done about the problem. The coverage of official statements and the political side of the crime wave made out for 35 percent of the coverage during the seven weeks the wave persisted (Fishman, 1978, p. 541). In this case where we have statistical data on how many crimes there really were, we are able to see that the media depiction does not always match real world events in the sense of severity or relationship to each other. Even without one severe or many smaller similar events, media *create* a news wave by connecting the events to each other. Receiving this media coverage of course influences recipients as well as journalists. This means we can perceive a crime wave as one relying on the increased media coverage only. Connecting this to the definition of key event of Brosius and Eps (1995) and Kepplinger (2011) would mean, that a key event does not have to be a real world event. As Kepplinger (1988, 673; 680) also points out that the media coverage is an ill measure of the real world developments, as Kepplinger also shows in several of his studies that he conducted alone or together with others.

²⁶ A rolling news wave hint very much in the direction of media hunts often seen in the discussion of media scandalising. See for example Allern and Pollack (2012).

Turning to Kepplinger, he has conducted studies on different event types. In Kepplinger (1988) he is analyzing nuclear energy coverage over a time span from 1965 to 1986. In the nineties Kepplinger and Hartung (1995) turn to a series of accidents that happened in a chemical industry in Germany 1993 and together with Habermeier they study key events dealing with the topics of AIDS, earthquakes and truck accidents (Kepplinger & Habermeier, 1995). In the study analyzing nuclear energy **Kepplinger (1988)** shows an interesting result that indicate that the already existing context or general opinion climate in which an event occur, can influence how it is depicted by the media. As he studied the years 1965 to 1986 he analyzed German newspaper coverage of both the accident on Three Mile Island 1979 as well as Chernobyl 1986. And since Kepplinger did not only analyze the news coverage after the accidents he was able to see what the coverage of the technique had looked like before the accidents occurred. And what Kepplinger (1988) found out was that in the end of the sixties, that is before any larger accidents happened, the German press already changed their way of covering nuclear energy, in that the coverage got more negative. This means that the press was already writing negative about nuclear energy when the nuclear accidents in Three Mile Island and Chernobyl happened. He argues that because the press was already negatively biased the accidents were manifest events used to emphasize the negativity of the technique. Kepplinger further concludes that the existing negativity was a reason for the intense media coverage of the accidents, and not the other way around (Kepplinger, 1988, pp. 663–664). In this publication, Kepplinger does not explicitly speak about key events, but this finding might be one clue to understand which events have the potential of becoming key events—if they belong to a topic or issue that is already newsworthy because of it being controversial and its negativity they might have potential to attract enough attention to become a key event. Other than that Kepplinger (1988, p. 672) also discovered that the German press gave a new perspective to medial nuclear energy coverage after the nuclear accident in Chernobyl. Before the accident in Chernobyl radioactive radiance was seldom a topic and when it was, for example after the nuclear accident in Three Mile Island, it disappeared quite fast from the media agenda. After Chernobyl however, the detriments caused by radioactive radiance and radioactive radiance caused by potential accidents in German nuclear power plants were mentioned more often than before the accident. In this case, it looks like news media used the negative events of the nuclear accident to emphasize the negative coverage they already followed and made them into key events. It is however impossible to know how the accidents would have been covered if the climate in which they occurred had not already been negative. However, it is obviously important to consider the social and political context or climate in which the key event occurs. If the media sees a way to use an event to emphasize arguments they are already making, this might actually influence how they are covered. In

the case of this study, where nuclear energy is a technique with a (political) history, this seems important to consider.

In the study of **Kepplinger and Hartung (1995)** a series of bigger and smaller accidents in the chemical industry company called Hoechst AG in Germany in 1993 became a key event and triggered several waves of media coverage. This study did not only analyze media coverage, but in order to compare the real world happenings with the depiction of the media as well as the perception of involved and affected people, they additionally analyzed accident documentation, press and citizens' information, interviews, and also conducted a qualitative media analyzes and reconstructed activities inside and outside the company. The way the communication was done lead the authors to call the accident a communication catastrophe rather than a chemical catastrophe (Kepplinger & Hartung, 1995, p. 10). Media focused strongly on the more severe accidents in the series of accidents, which the authors evaluate as appropriate. The media also covered an incident where chemical material leaked and affected many people living outside the industry much heavier than an explosion in the industry by which one worker was killed (Kepplinger & Hartung, 1995, p. 15). This shows that the media has been more interested in an incident affecting many non-involved citizens with only speculations about possible future harms, rather than one severe accident in which actually a person died. It also became obvious that the media rather focused on incidents that were well observable through for example smell or noise, regardless of whether these incidents were the more severe ones. There were three incidents that triggered three waves of media coverage. The waves were however quite different from each other. The first accident triggered heavy coverage which stayed on a high level for two weeks before it died out. The second accident triggered even more media coverage than the first one, but the interest died out much faster this time. The third accident made out for some media attention, but not on the level of the previous accidents and the coverage was mostly negative in tone (Kepplinger & Hartung, 1995, p. 16). The waves of coverage show what Kepplinger and Hartung define as a key event—that following incidents may be made to seem more similar to the initial one than they might actual be, and that they are given more attention than they would have been without the initial key event (Kepplinger & Hartung, 1995, p. 21). The way the media covered the incidents triggered an overreaction and panic in the population. The media published false information without correcting it, they did not communicate measured values and did not provide the possibility of classifying and comparing the accidents to other known accidents. They discredit the communication outgoing from the company so that the media depicted reality was believed to be the true picture of what was going on. Workers from the company were not believed after the media put them in a light of not telling the truth. Through these and other errors the population ended up in panic and confusion (Kepplinger & Hartung,

1995, pp. 153–155). This example shows that after a real world accident that is made a key event by the media, things can escalate, so that similar to Fishman's (1978) study, the perception of the event is skewed and no one knows in the end what the truth is and if there is real reason for concern. Interesting about their result is also, that similar incidents were also covered and put in relationship with the initial event.

In the study of **Kepplinger and Habermeier (1995)** they again analyze German news media as they look at daily newspapers and weekly papers during a period of four weeks before and four weeks after three key events (Kepplinger & Habermeier, 1995, p. 376) on the issues of AIDS, earthquakes and truck accidents (Kepplinger & Habermeier, 1995, p. 371). Similar to previous findings, they discovered that the news media covered events and topics related to the key events circa four times more after the key events than in the period before (Kepplinger & Habermeier, 1995, p. 378). And this even though the real world events did not increase (Kepplinger & Habermeier, 1995, p. 381). The heavy increase was only to be perceived in the media coverage and the increase was not only due to the reports on the key events themselves, but on similar events and topics being reported after the key event (Kepplinger & Habermeier, 1995, p. 379). Interestingly enough, they also found a great number of articles dealing with events that had happened before the key event, but were not dealt with at the point of time when they did happen (Kepplinger & Habermeier, 1995, p. 383). So not only does key events lower the threshold for similar events to get media attention, but they also enable a dealing with past events that were similar.

Another much cited study of **Brosius and Eps (1995)** discovered a similar way of dealing with key events. They analyze four key events connected to violence against aliens and asylum seekers in Germany (Brosius & Eps, 1995, p. 393). Besides analyzing the heavy media coverage of those events in German television and press, they also analyzed statistical data on crimes. As they point out the operationalization and identification of a key event is not self-evident, "It is difficult, however, to identify – aside from coverage – objective criteria for classifying such events as key events. We therefore restrict our definition to those events with heavy coverage" (Brosius & Eps, 1995, p. 407). Including crime statistics they can at least discover if the media coverage is grounded on real world incidents. Their results show that not only were the attacks they focused upon heavily covered by the media, but also other crimes similar to those were given more media attention. The authors conclude, that without the initial crimes, the similar events would not have been given attention (Brosius & Eps, 1995, 391; 393). Similar to Fishman (1978) they therefore point out that key events were able to shape following coverage, which led to recipients not knowing whether or not these incidents really happened more often than before (Brosius & Eps, 1995, p. 393). The key events

also stimulated the public and political discussion on the issue of this kind of violence (Brosius & Eps, 1995, p. 393). Giving new issues attention and adding new perspectives to already established issues are two ways key events can influence journalistic work according to the authors. They make the example of the nuclear accident in Chernobyl, which added a new quality to the issue of nuclear energy supply and safety. Before the, by that time biggest known accident, the discussion on the risks of nuclear energy was mostly an academic one. With the accident in Chernobyl the issue could be tied to a real event, an event which radioactive fallout had affected and threatened many people and gave the issue a new quality (Brosius & Eps, 1995, p. 394). The dimension of detriment was clearly added to the issue of nuclear energy. Therefore, a key event is not only triggering heavy media coverage for a certain amount of time, but it can also influence and shape following media coverage and the journalistic way of news selection (Brosius & Eps, 1995, 393; 395; Kepplinger, 2011, p. 74).

A more recent study of the Fukushima accident by **Weiss, Markutzyk and Schwotzer (2014)** relies on both the theoretical approach of key events as well as the focusing event, which is a similar concept used mostly in political science. They were asking the question of if Fukushima was a key event in the communication science senses or rather a focusing event with direct influence on policy without the pressure coming from media coverage. The question was asked because there was a radical change in nuclear politics in Germany after the accident in Fukushima, with Germany deciding to phase-out their use of nuclear energy. They were interested to find out if the accident in Japan was used by the media to argue for a phase-out of nuclear energy or if Fukushima rather was an opportunity for the politicians to change direction (Weiß et al., 2014, p. 79). In order to find the answer to this question, they analyzed German newspapers and television news from the time period beginning March 2011 (some days before Fukushima was struck by the accidents) until mid-July the same year (Weiß et al., 2014, p. 85). What they discovered was that the media coverage of the nuclear accident in Fukushima and the political debate in the media on nuclear politics were discussed separately from each other. Only rarely were both topics mentioned in the same news articles (Weiß et al., 2014, p. 86). When they plotted both discussions over time, they recognized that the nuclear political debate was always more prominent after the news surge of nuclear accident coverage had calmed down in the first weeks after the accident happened. They chose to divide the media coverage they analyzed from these four months into three phases. The first phase lasted two weeks and was where the accident was more prominent than the nuclear debate. In the second phase of five weeks, both topics were similarly prominent but with nuclear politics given more media attention. The third and last phase lasted six weeks and it was here where the political debate on nuclear energy seemed to rip loose from the accident in Japan, as the media coverage out of a political

perspective became clearly more prominent (Weiß et al., 2014, p. 87). However, these two separate topic lines of media coverage did not mean that Fukushima was not mentioned in the political nuclear energy debate; Fukushima was the most prominent subtopic in this category of media coverage and was mentioned in 43 percent of all news articles, so it was clearly the background topic of this discussion (Weiß et al., 2014, 88; 90). The authors also looked at the statements being made and if these were positive or negative towards a nuclear phase-out and the result was very clear that 73 percent of all of the statements were in favor of a nuclear phase-out (Weiß et al., 2014, p. 91). They conclude that the nuclear accident in Fukushima was clearly the trigger, the key event for the radical turn in German nuclear politics and the media coverage of this political debate. However, Fukushima is a background topic in this discussion and it is not made a key event by the media putting pressure on policy. It is rather the media that covers the political debate that was triggered directly by the nuclear accident. Therefore, they argue that Fukushima is a bad example of communication science understanding a key event the way it happened in Germany. Of course, the event triggered media coverage but it was not the media coverage that triggered the political debate – the nuclear accident itself did (Weiß et al., 2014, p. 96). Therefore, as they argue, Fukushima is rather a focusing event (Weiß et al., 2014, p. 97). However, it is not completely convincing how it is possible to divide those two concepts. Especially in the case of an accident so far away—how and when would the German politicians have heard about the accident if not through the media? Nevertheless, it seems plausible that the media did not yet cover the accident as a political problem to Germany, and that the politicians were the first ones to jump onto that train. Due to the nuclear history in Germany, fast acting politicians might even be expected.

Those studies dealing with key events can be seen to be the basis for the rather young approach called *media-hype*. The approach media-hype is very similar to the one of key event. What distinguishes media-hype from the key event approach seems on a first glance to be, that the term media-hype include the triggering event itself as well as the following *hype*. Whereas key event would seem only to deal with the event itself, which as previously discussed studies show, media-hype does not. The approach of key event also looks at short and long time influences of key events on media coverage. Therefore those two concepts are closely related and for that reason I will turn to a few media-hype studies. Vasterman (2005) introduces the approach of media-hype and states that it can become a valuable instrument for news research (Vasterman, 2005, p. 508). The concept can be used, so Vasterman (2005, p. 508) to analyze the dynamic of media-hypes and to understand the role media-hypes play to framing and social amplification. In his study he conducts a content analysis of Dutch daily newspapers (Vasterman, 2005, p. 521) in order to see how they report on street violence in the Netherlands

(Vasterman, 2005, p. 508). In defining media-hype Vasterman says a media-hype must include a news wave that starts off with a key event which is followed by a consonant news wave. In this news wave is not only the key event of interest but also similar cases, which are reported more often than before as well as thematically related news (Vasterman, 2005, p. 516). What he found under the time period from 1997 to 2000, was that there were four news waves covering senseless violence and every time the wave appeared it was bigger than the last time and they were always triggered by a key event. The peak of media coverage was the highest some days after the key event and then the media coverage slowly declined over a time period of some weeks. Very soon in the media coverage the news on the key event itself was outnumbered by thematically related news and similar events were often reported as well (Vasterman, 2005, p. 522). Looking at frames in this media coverage, Vasterman (2005, p. 526) argues that journalistic standards are violated because of the positive feedback loops that enforces the same frame over and over again. Journalists are searching for information that can help reinforce the chosen frame and therefore there is little variance in the news coverage. The increasing competition between media houses triggers more uniformity in the news coverage, and not as wished more diversity (Vasterman, 2005, p. 527). He concludes with saying: "A news wave is not a media-hype because it exaggerates or distorts reality, but because it is a special kind of news wave created by the self-reinforcing processes in the news production" (Vasterman, 2005, p. 527). The uniformity and the reporting of similar events to the key event, as well as the high media attention seem to be very similar to the studies on key events.

In two studies by **Elmelund-Præstekær and Wien (2008)** and Wien and Elmelund-Præstekær (2009) based on the same data analyze five media-hypes on the care for elderly in the timespan 2000-2005 in Danish newspaper (Elmelund-Præstekær & Wien, 2008, p. 252). In the 2009 study they focus on which kind of event have the potential of becoming a trigger event for a following media hype as well as on the structure of media-hypes (Wien & Elmelund-Præstekær, 2009, p. 183). Furthermore, the study from 2008 focuses more specifically on if and what kind of influence media-hypes can have on public policies that make out for the central issue of the hype (Elmelund-Præstekær & Wien, 2008, p. 247). In their analysis they distinguish between political influence on a local and a national level (Elmelund-Præstekær & Wien, 2008, p. 250). Regarding which kind of events that would potentially be a triggering event showed that in general a topic needs to be of concern of a big part of society in order to become a media-hype (Wien & Elmelund-Præstekær, 2009, p. 186). In the case of care for elderly it is a topic of concern of many, but it affects a minority of the population. They point to this fact and refer to Downs (1972) who also states that social problems like this directly affecting a minority but being of benefit and concern of the majority run through the issue

attention cycle (Wien & Elmelund-Præstekær, 2009, pp. 186–187). Interesting to point out regarding the structure of media-hypes, is that the one the authors analyzed here tended to reoccur once every year and would typically last for three weeks. They interpret the duration of three weeks by the sources journalists use. First, journalists tend to speak to politicians, interest groups, employees and relatives. After that they concentrate more on experts in order to get more facts. Since the experts presents facts and not opinions able to discuss, the media-hype tend to slow down when the experts become more present in the media coverage (Wien & Elmelund-Præstekær, 2009, p. 196), that is, if the experts do not present a broader perspective on the issue which fuels the media-hype again. The re-fuelling tends to happen two or three times during the media-hypes they analyze and it gets smaller and smaller for every time a new event or related topic is introduced and discussed (Wien & Elmelund-Præstekær, 2009, p. 197). Regarding the kind of influence media-hypes can have, they did find political discussion in the media-hypes, but no political acting. On a national level, they do not see that the media-hypes trigger any political action like changing laws, new policies, increases of budgets etc. (Elmelund-Præstekær & Wien, 2008, 253-254; 262). On a local level, this was somewhat different; media-hypes were more influential on this level. The analysis revealed for example an increased budget for the caretaking on a local level (Elmelund-Præstekær & Wien, 2008, p. 262). But foremost the media-hypes provided a window of opportunity for political actors: they got the opportunity to present their political ideas (Elmelund-Præstekær & Wien, 2008, pp. 253–254). The authors conclude that news making is faster than policy making. In the three weeks of the media-hype no severe political changes could be made (Elmelund-Præstekær & Wien, 2008, p. 262), but politicians clearly took the opportunity to promote their ideas to the mass media recipients (Elmelund-Præstekær & Wien, 2008, p. 262). To summarize triggering events are events that concern large parts of the population, which again draws the line to Downs (1972). Furthermore, a media-hype seems to typically last three weeks and is a window of opportunity for different type of actors to try to make a change. In those cases actors like politicians and interest groups were the first to occur in the media coverage and where replaced by experts. Contradicting the results of Vasterman (2005), who found larger and larger news waves, Wien and Elmelund-Præstekær (2009) found smaller and smaller news waves as the wave was re-triggered.

Even though there are many studies that deal with the very similar notions of key events, triggering events and media-hypes, there has neither been any agreement on which accurate indications clearly identify a key or trigger event from any other event nor on how media coverage following such an event or making out for a media-hype clearly differ from “every-day coverage”. This problem was identified by the researchers Boydston, Hardy and Walgrave (2014). As they state they want to turn “media

storms from a ‘you-know-it-when-you-see-it’ phenomenon into a clearly defined media process” (Boydstun et al., 2014, p. 510). In their study on *media storms*, they suggest a solution to this operationalising problem. Since the approach of *media storm* presents a valuable instrument in how to identify a key event as one and additionally potentially can be used to separate media coverage phases from each other, this study shall be described here.

Boydstun, Hardy and Walgrave (2014) made the conclusion that studies using terms like key event, trigger event and deal with news waves and media hypes refer to very similar concepts. Based on this previous work they present the concept of media storms. A media storm is as by the other authors a sudden and high level of media attention to a specific event or issue which is sustained for a period of time (Boydstun et al., 2014, p. 509). The contribution Boydstun et al. (2014) do is making this concept of media storm empirical verifiable by carefully defining a media storm by size of the media coverage, explosiveness of the media attention and the timely duration of the attention (Boydstun et al., 2014, pp. 511–512). Their definition of a media storm is put together of these aspects and is: “*an explosive increase in news coverage to a specific item (event or issue) constituting a substantial share of the total news agenda during a certain time*” (Boydstun et al., 2014, p. 511 highlighted in original). They also consider a fourth dimension which in the one of a media storm happening in all media, which they in their study however do not test, but which seems very probable to be. Based on their study and the data they derive, they develop a concept of media storms that others can use and test empirically (Boydstun et al., 2014, pp. 511–512). In their study they look at the USA and Belgium and chose to analyze ten and nine years of front page (front section for the Belgium daily, because it only has one story on the front page) media coverage in the daily newspapers *New York Times* and *De Standaard*. In these newspapers they collected all news stories on the front page or the front section and searched for signs of media storms (Boydstun et al., 2014, p. 517). These signs being a 150 percent increase of media attention to an issue or an event from one week to the next one—measuring explosiveness; 20 percent of the news stories over the period of one week should be dealing with the issue—size; and the duration of this high attention should last in minimum one week. The storm is being considered to be over when the 20 percent of daily coverage is no longer given (Boydstun et al., 2014, p. 519). The authors point out that these criteria might seem arbitrary, and therefore they show data on how the number of storms changed if they lowered or rose the percentages and that the threshold values chosen let separate different types of media coverage, namely media storm coverage from non-storm coverage, which differ from each other not only by level of attention. With the threshold values 150 and 20 percent they caught 121 media storms in the *New York Times* and 60 in *De Standaard* which gave them support for

statistical analysis and covered the big news stories of the decade. More importantly than having enough statistical power in the analysis, the authors showed that the identified storms and their coverage was different from the other news coverage, so as media storms to have a different dynamic than non-storm media coverage (Boydstun et al., 2014, pp. 519–525). If this holds true for other “media storms” which would numerically apply to this concept, is an empirical question and certainly needs further verification. Further studies applying the concept would also verify if it holds true that media storms, as defined by Boydstun et al. (2014) are always different in nature from non-storm coverage. A further extension to the model would be to not only investigate the front page or section, but rather the coverage within the newspaper.

However, media storm coverage differs from non-media storm coverage according to Boydstun et al. (2014) and they develop upon how media storm coverage differs from non-storm coverage. According to the authors, whereas a media storm is explosive because of the sudden attention shift and the following stable interest for the same topic over a period of time, media storms are said to be milder because storm coverage changes gradually over time. Non-storm coverage could be said to be several mini explosions on many different topics and for only short time. Therefore, the authors argue that storm coverage is a different type of media coverage because it is not only very intense coverage, it also has different dynamics compared to normal news coverage. A storm is more gradual in its form and less explosive and it also is less diverse in the sense of topics, a storm covers only a few key issues (Boydstun et al., 2014, p. 523). As the authors state, it is a well-known phenomenon that the media agenda tend to influence what people think about. They take an interesting approach to how to test the influence of media storm to the public’s behaviour in the sense of active information search. In order to be able to decide if it is the media coverage, i.e. the media storms, or the event itself that influence the public agenda, they found four media storms during their analysis period, which covered topics or issues that also were covered in non-storm mode. For example they had the media storm on the terrorist bombings in London 2005 compared to the non-media storm on the terrorist attack in Madrid 2004. Then they analyzed the Google Trend data, which reports for the Google searches on daily and geographical basis on to the events related search requests. Their results were clear, that the search requests, i.e. actively information seeking, rose strongly for searches on the media storm issues, but not at all or not nearly as strong for the events only covered in a non-storm mood (Boydstun et al., 2014, pp. 526–527). Therefore, they conclude that media storms have a different dynamic than *every-day* media coverage have and according to their analysis of Google Trend data they see, that media storms also have consequences in the public attention to issues. With their conceptualization and operationalization it is possible to identify media storms (Boydstun et al., 2014, pp. 528–

530). The interest and need for more information by the public as well as by journalists was also discussed by Esser (2011), Rauchenzauner (2008) and Vasterman (2005).

After showing those ways in which key events, trigger events, media-hypes and media storms can be identified and have implications for the media coverage, those aspects together with the notions and evidences previously discussed in the phase models will be compiled in a summarizing chapter here next. Those inspiring approaches will then lead onto the model I suggest for analyzing risk communication, which will be presented in the following chapter.

5.3. Interim Conclusion – Attention Models & Phases; Key Events’ and Media-Hypes’ Implication for Media Coverage

When asking the question to *which* issues or events media attention is given and *how* media give attention to issues and events, one of the first things to notice is that it varies and depends on different factors. As Downs (1972) demonstrated, media attention changes over time and issue attention can be divided into phases, which for some issues seem to follow a cycle. In the well-known *Issue Attention Cycle* by Downs (1972) he describes five phases. Other authors describe four (Eisner et al., 2003) or three phases (McComas & Shanahan, 1999). Independently of the number of phases the basic pattern stays the same: first the issue is of interest only to smaller groups in society and does not harvest much media attention; in a next step something triggers attention, for example a particular event, or something changes in the context of the issue that lets it leave the rather passive first phase and enter into an second considerably more active state. What exactly happens after that what makes the issue return to a stage of lower attention, is different in different cases. Downs (1972) points out that there will be a phase of *alarmed* and *euphoric enthusiasm* (second stage) that shrinks more and more the more the cost of solving the problem gains awareness. At some point the interest and attention is so low, that the issue can be considered to have arrived at square one (Downs, 1972). Another reason for the attention to decline is mentioned by Eisner et al. (2003), they claim that the signs of political action or even a political solution can lead to a decline in attention. Seen from the policy perspective, this is the point in the policy cycle in which the issue enters the third phase of the policy cycle, the policy definition phase. In this phase the media do not anymore have large influence on the political processing of the issue, and might also not give it much attention. Therefore, the phase in which the media attention decrease, might in some cases be the point in time in which the issue enters the actual political work on the issue.

How those media attention phases form in more detail is however depending on different factors such as the cultural context, the country they occur in (Brossard et al., 2004),

the social and the political context (Eisner et al., 2003; Nisbet & Huge, 2006) as well as the journalistic presentation (Eisner et al., 2003; McComas & Shanahan, 1999). It might well be that attention phases form differently in for example different cultural contexts (Brossard et al., 2004). In many cases it becomes obvious that there is a trigger involved in this phase pattern. For an issue to go from the phase of not being due to much attention at all, to escalate and in some cases even be due to an extremely high increase of media coverage, there is often an event of some sort that will trigger interest and point attention to it and let the issue leave the first phase of *latency* (see for example Eisner et al., 2003). Such triggering events might have different meanings in different political and cultural contexts. Further, this might allow attention phases to look differently, even if the event is the same.

The phase of high attention is in focus in many studies since it is the point in time where changes might happen and might be observable. The studies based on key or trigger events, as well as media-hype and media storm were introduced in the communication science in order to analyze the way journalists and mass media work and function when dealing with special events (Weiß et al., 2014, p. 80). According to Brosius and Eps, a key event will lead to a discussion on the issue of the event that in some cases shapes following media coverage (Brosius & Eps, 1995, 393; 407; Kepplinger, 2011, p. 74). Studies observe that key events not only trigger high media attention, but those events sometimes also changes the “nature” of the coverage. This leads to the question if the nature of the coverage has changed so much to be considered not covering the initial issue anymore. If for example nuclear energy coverage change its nature to become a discourse where climate change is more in focus than nuclear energy, can the issue then still be considered the same? In some cases a framing analysis might enable answering this question, as it might allow observing that the issue is the same, but the framing of it has changed. Luke (1987) develops interestingly on this issue in his discussion of the, what he calls, “packaging” of Chernobyl. The same accident was reported, or packaged, very different in different contexts. In some (western) countries the accident was considered to be caused by poor knowledge and discipline of the nuclear power plant workers, and the information and the meagre information flow on the accident was criticized. On the other hand, Gorbachev related to the domestic accident and the accident reports as accurate and other countries media coverage as lies. This example shows that even though the event is the same, the media coverage can be very diverse.

Because scientists observe that key events not only trigger a news wave, but they also change the “nature” of the coverage, those concepts are important to consider when wanting to know more about how media treat issues and events. As the interest in this study is how a key event like Fukushima influences media’s risk communication, those

approaches become valuable instruments. However, if only looking at the phase of high media attention, in the case of risk, this phase might not depict risk communication as it is understood in this study (see chapter 4.3). There are studies that analyze longer time spans of media coverage to an issue, but not many (or none to my knowledge) scientists have focused on a larger time span to capture risk communication understood in a broader sense. This study aims to close this research gap by analyzing a longer time span and therefore takes on a phase model and intend to capture not only the *hot* phase of coverage, but also the *cold* phases as well as *warming-up* or *cooling-down transition* phases. As it is argued here, only by casting light on all phases, statements on risk communication as a whole can be made.

From the studies on key events, trigger events, media-hype and media storm that go into detail of how media coverage change in this hot phase, there is much to learn and the studies with those approaches make a perfect complement to the phase models by for example Downs (1972) and Eisner et al. (2003). When looking at which effects key events and trigger events can have on media coverage it is obvious that there can be influence on different levels. Those influencing factors might not only have an effect on the *hot* phase, but as well on the *cold* and the *transition* phases. Those influencing factors shall be compiled (see also overview in Table 2) gives here from some of the several studies available in this field of research. In general, key events can have influence on the media and journalists and their depiction of the event, the issue and actors; it can have direct influence on different type of actors in society, for example politicians, as well as on the recipients. In some studies it is due to discussion whether or not the influences on these levels are of short or longer duration and how stable those changes might be over time (Rauchenzauner, 2008).

Table 3 Comparison of key event, focusing event, media hype and media storm effects

Impact level	Effect	Key event/ focusing event	Media-hype	Media storm
Event	Establish new issue ¹⁶	x		
	Rise news value of similar events ^{2, 3, 4, 5, 11, 13, 16}	x	x	
	Assimilation of similar events ^{3, 5, 11}	x	x	
	Give new perspective, frames, narratives to established issues ^{4, 9, 12, 13, 14, 16}	x	x	
	High media attention directed to the event ^{4, 13, 15, 17, 19}	x	x	x
Media	Sensationalism ¹⁶	x		
	Higher news value by intermedia agenda setting ^{8, 13, 15}	x	x	
	Multimediality – coverage in all media and more of the same ^{11, 18}	x	x	x
Journalists	Focus of experts, politicians, affected persons ¹⁶	x		
	Ignorance of information if not fitting in framing ¹¹		x	
	Need for more information ^{11, 13, 16}	x	x	
	Impression that these events happen more often ^{2, 4, 11}	x	x	
Actors	More attention from journalists ¹⁶	x		
	More different actors and their activities become attention ^{4, 11, 16}	x		
	“Window of opportunity” ¹⁴		x	
	Report similar experiences to get attention ¹¹		x	
	Can put pressure on the political or economic system ^{1, 2, 6, 13, 17, 19}	x	x	
Recipients	Ask for more information ¹³	x		
	Unrealistic issue perceptions ^{11, 12}		x	
	Impression that/insecurity if these events happen more often ^{2, 4, 11, 13}	x	x	
Time span	Short-term effects ⁷ / long-term effects ¹³	x		
	Duration of at least one week ¹⁸			x
	Long-term effect of higher newsworthiness of issue ¹¹	x	x	

Note. ¹ Downs 1972, ² Fishman 1978, ³ Kepplinger 1988, ⁴ Brosius & Eps 1995, ⁵ Kepplinger & Hartung 1995, ⁶ Birkland 1998, ⁷ Kepplinger 1998, ⁸ Rössler 1998, ⁹ McComas & Shanahan 1999, ¹⁰ Kingdon 2003, ¹¹ Vasterman 2005, ¹² Vasterman et al. 2005, ¹³ Rauchenzauner 2008, ¹⁴ Elmelund-Præstekær 2008, ¹⁵ Wien & Elmelund-Præstekær 2009, ¹⁶ Esser 2011, ¹⁷ Kepplinger 2011, ¹⁸ Boydston et al. 2014, ¹⁹ Weiss et al. 2014

First, influences to **the event itself and similar events** shall be discussed. It starts with an event of any type, which triggers intense media coverage and a steep rising news wave that covers the event (Boydston et al., 2014; Esser, 2011; Rauchenzauner, 2008;

Wien & Elmelund-Præstekær, 2009). The intense media coverage of this event can establish a new issue and start an agenda building²⁷, and it can also be the triggering point to an already existing issue and enable an entering into an Issue Attention Cycle²⁸ (Downs, 1972; Esser, 2011, pp. 46–47). Not only can a key event trigger a higher degree of attention, but it can also potentially give an already established issue a new perspective (Brosius & Eps, 1995, p. 394; Esser, 2011, p. 46; Rauchenzauner, 2008, p. 25; Vasterman, 2005, p. 516). Therefore, the addressing of the event and its topic can redefine it; there is an opening for new points of view, new frames, new narratives, new main topics, new actors, etc. (Elmelund-Præstekær & Wien, 2008; McComas & Shanahan, 1999). The media coverage of the event is influencing the journalistic news selection criteria, giving other similar events and topics higher newsworthiness (Brosius & Eps, 1995, p. 394; Vasterman, 2005, p. 514). Therefore, it triggers media coverage of similar events and related topics (Brosius & Eps, 1995; Esser, 2011; Fishman, 1978; Kepplinger, 1988, p. 680, 2011, p. 87; Kepplinger & Hartung, 1995, p. 21; Rauchenzauner, 2008, p. 25; Vasterman, 2005, 514; 516). This association of related events and topics can lead to an enlargement of the event itself (Vasterman, 2005, 511; 517). This association of other events and topics is also being stretched by journalists. There is a tendency towards an assimilation of events and topics to make them seem more similar to the key event than they really are (Kepplinger, 1988, p. 680; Kepplinger & Hartung, 1995, p. 21; Vasterman, 2005, p. 514) and through this, the association circle of events and topics to the key event becomes wider. In this accumulation and swirling together of related and assimilated events and topics, a news wave arises. Recipients as well as the media and journalists are rolled over by this wave and can lose count and get the impression that these events actually occur more often than before, when in reality they are probably only given more media attention (Brosius & Eps, 1995, pp. 393–394; Fishman, 1978; Vasterman, 2005, 510; 514–515). Vasterman (2005, p. 513) speaks about “positive feedback loops,” in which the event or topic is rebooted independently if something new really happened or not. In addition, there is an inter-media-agenda-setting going on (Rauchenzauner, 2008; Rössler, 1998, p. 8), because media consider news to be newsworthy if it has already been covered by other media (Wien & Elmelund-Præstekær, 2009, p. 187).

It is to be questioned if those news waves really depict reality as it occurs. Vasterman points to this when he emphasizes the media *creation* of the news wave (2005, p. 510) and argues that there is a mismatch between the media coverage and the real world in terms of occurrence rates and also if the news is really that important or if they are made

²⁷ See also Lang and Lang (1981) on Agenda Building.

²⁸ See also Downs (1972) on Issue Attention Cycle.

important by the media (Vasterman, 2005, p. 509). This can of course be, but as Wien and Elmelund-Præstekær (2009, 185; 187) point out, it is hard to prove empirically if events are true events or rather media created or media events *created* by other actors. If events are created without much backing up in reality or not, at some point the news wave dies out when the issue is exhausted. However, when a similar event happens again, the issue will have a lowered threshold to get into the media, because of the heavy media coverage that the event and its topic have already had, it will be more newsworthy next time it occurs (Vasterman, 2005, p. 515). This could be considered a rather long-term effect.

The *second* focus of implications that the key or trigger event have are the effects they have on the **media** in general. There is, of course, a commercial benefit to those news waves. They are often due to sensationalism and it might be easier to sell newspapers during the news wave period (Esser, 2011, p. 46). The news wave is also a period of uniformity between the media, because everyone is covering the same event. In this context, Boydston et al. mention the factor of *multimediality* (2014, p. 513). Because what other media chose to cover is what is considered to be news, other media will also cover it and through this passing on there will be more of the same (Vasterman, 2005, p. 514). This is also one clue on how to identify a key event according to Rauchenzauner (2008, p. 28); if all media are covering it, it is a key event and is considered to be one of the signs making out a media storm (Boydston et al., 2014).

The impact key or trigger events have on **journalists** is the *third* focus. The need for new information grows in the key event situation, not only in the recipients, but also in journalists. A broader and deeper information seeking is started (Esser, 2011, p. 46; Rauchenzauner, 2008, 21; 25; 28; Vasterman, 2005, p. 509). Journalists speak to more experts, politicians and victims, whose statements are then presented in the media coverage (Esser, 2011, p. 46). Hence, there will be more of the same events and topics but a differentiation on the level of actors speaking. At the same time, information can be ignored by journalists if it does not fit into the framing of the key or trigger event that they are pursuing (Vasterman, 2005, p. 526). As already mentioned, the heavy coverage can influence journalists themselves, so that they (also) do not know if the events are happening more often or are only given more media attention (Rauchenzauner, 2008, p. 25). There is an orientation of the journalists to each other since they are in competition with each other. One cannot afford not to cover news considered as news by other journalists. And, in this process the leading media have the power of setting the agenda. The inter-media-agenda-setting often starts off in the higher quality media and topics as well as opinions that can be adapted by other journalists (Rauchenzauner, 2008, p. 26; Rössler, 1998, p. 8).

The *fourth* focus lies on what these news waves implicate for **actors** like politicians, interest groups and similar. As Esser points out, journalists are in need of a lot of information and start to give more attention to different actors as they can contribute diverse information (Brosius & Eps, 1995, p. 395; Esser, 2011, p. 46); there is also more media coverage of activities of different actors (Vasterman, 2005, p. 516). Not only are they given more attention by the media and journalists, the actors themselves also see this “window of opportunity” (Elmelund-Præstekær & Wien, 2008, p. 263) and seize it. If media attention is given to a topic or issue where politicians, activists, lobbyists and other groups have a specific interest, they seize the moment of the opened window to plant and discuss their point of views (Elmelund-Præstekær & Wien, 2008, p. 257; Esser, 2011, p. 46; Kingdon, 2003; Vasterman, 2005, p. 515). This can also go beyond only discussing the topic; interest groups can seize the moment in order to put pressure on politics or the economic system (Birkland, 1998; Downs, 1972; Fishman, 1978; Kepplinger, 2011, p. 75; Rauchenzauner, 2008, p. 25; Weiß et al., 2014). Interest groups and other actors can also try to give new topics a career (Rauchenzauner, 2008, p. 25). In order to promote their own point of view, they can also report similar experiences in order to get attention (Vasterman, 2005, p. 515). By this pressure that might evolve, the event and the situation are perceived as getting worse and worse and escalating into a crisis. Authorities can be forced to make quick decisions. These hasty actions are giving the situation even more seriousness and this reinforces the social concern and gives fuel to the news wave (Vasterman, 2005, p. 526). The ability to induce political action is, however, ambivalently evaluated. Elmelund-Præstekær and Wien took a closer look on the influence media-hypes have on politics, and they have, however, found no or little influence (Elmelund-Præstekær & Wien, 2008; Wien & Elmelund-Præstekær, 2009).

Fifth, this intense media coverage of course also influences the ones receiving it, the **media recipients**. The public attention is being drawn to these events and issues being reported so heavily and the recipients as well ask for more information (Rauchenzauner, 2008, 21; 25). Moreover, they cannot be sure whether the incidents given so much attention actually happen more frequently than before the key or trigger event; if the media is just giving them more attention or maybe if they themselves are more attentive to these events and topics when consuming the media coverage (Brosius & Eps, 1995, pp. 393–394; Fishman, 1978; Vasterman, 2005, pp. 514–515), but they might think that the events are happening more often (Rauchenzauner, 2008, p. 25). Believing this, they can think that the situation turned into a real crisis (Vasterman, 2005, p. 509). Vasterman points out that the media-hype can lead to a unrealistic risk perception and mentions the example of nuclear energy (Vasterman, 2005, p. 526; Vasterman et al., 2005).

The question of **how long** the effects of such key events, news waves and media-hypes endure, is not asked by all researchers, but specifically pointed out by Rauchenzauner (2008) as well as mentioned by Kepplinger (1998) and is the *sixth* and last focus of effects here. Kepplinger (1998, p. 30) argues key events can only change the media coverage for a short time period. Once the news wave has calmed down, the media coverage returns to be as it was before the key event. Rauchenzauner on the other hand emphasizes the power of key events to change the media coverage on a short term, as well as in the long run (Rauchenzauner, 2008, p. 21). Although she also points out, that there can be a distinction between *real* and *believed to be key events*, whereas the real ones can have a long-term effect on media coverage and the others not (Rauchenzauner, 2008, p. 179). She also outlines that long-term changes are not often seen, but can be identified by new words or expressions being introduced and used, as well as pictures that are used long after (Rauchenzauner, 2008, p. 43). In the long run also new topics can arise due to the key event (Rauchenzauner, 2008, p. 172) as well as new perspectives on already existent topics (Rauchenzauner, 2008, p. 174).

This overview of phase models, how key event trigger media attention and influence the attention cycle supplies a basis for this work to stand on. In the next step it is important to see what research has already found out dealing with the media discourse of the specific risk of interest here, namely nuclear energy production. Therefore the aim of the following chapter is to give a broad overview of studies analyzing media coverage dealing with the nuclear energy debates.

6. Media Reality & State of Research – Risk Communication and Nuclear Energy

There are many ways of how to tell a story. Communication research is often interested in finding out how mass media tell stories, i.e. how do mass media report events and create a media reality? Taking the example of a nuclear accident: The media reporting of such an event can focus on the accident itself, how it happened and evolved, ask workers and nuclear energy experts to provide information on how a nuclear power plant work; or the media could emphasize the political decision behind the usage of the technique, report on when and by whom the decision was made to build the power plant; or media could focus on the affected and evacuated people, tell their stories, how they now are without all their belongings, worried about radiation, publish pictures of their children not allowed to play outside anymore. General nuclear energy media coverage can present the technique as a beneficial one for the climate, since it does not release as much CO₂ as other energy sources do. Or it can be presented as an unreliable and uncontrollable technique, which no one can fully control and no one knows when the next big accident will happen and release the next life threatening invisible radiation cloud. Different actors can be deployed to support those ways of presenting the issue. Thus there are many ways for media to cover issues and events. There are also different empirical approaches used when studying this *media reality*. Two common approaches are the rather quantitative content analysis and the rather qualitative discourse analysis, approaches that do show overlappings. Studies analyzing the content of media coverage often focus on topics or narratives of media coverage of issues, the way of presenting those issues and topics (framing²⁹), the actors that are speaking in the coverage, which arguments are put forward by them and by the journalist her or himself and also if there

²⁹ This study is not a framing study even if the empirical analysis does measure components that are used by different scientists analyzing frames, for example topics, actors, their arguments and a general bias. Framing is an approach understood, defined and used differently in communication science and an approach needing deeper discussion. Reese notes (2007) that the different framing approaches has resulted in that scientist doing framing analyzes “often give an obligatory nod to the literature before proceeding to do whatever they were going to do in the first place” Reese (2007, p. 152). This study will not involve in this discussion but mention the meta-analysis on framing analyzes that Matthes (2009) conducted. Matthes also cites Reese and in his article he systematically and critically looks into the problem of a concept being used by many, in different ways. In his article, which I recommend for anyone interested in this discussion, Matthes conducts a content analysis of 131 framing studies published in the leading communication journals from 1990 to 2005 (Matthes (2009), doing so he presents five research questions. The first one asks which definitions of media frames are used to operationalize frames. The second and third questions look into what types of frames are found in the content analyzes, and if visual elements are used as an element of a frame. The fourth question wants to know to what extend the framing research is based on theory, and also to what extend the antecedents and consequences of frames are looked into (Matthes (2009, p. 352) (that would be to also consider the work of journalists as frame users or makers and also the effects of frames on the receiver). The last question is on methods – how are the frames extracted from the material and is the intercoder reliability shown (Matthes 2009, 353).

is a general tendency and a bias (for example pro or in favor nuclear energy) in the coverage. Those aspects help to better understand media coverage and they shall be used in this study to better understand how mass media report on risk. This chapter will take a closer look at what is known about this media reality when dealing specifically with the risk of nuclear energy. This research overview aims at building a base for the to be suggested Risk Attention Phase Model. The overview will present and discuss results of previous studies analyzing media risk communication of nuclear energy. But before diving into this rich state of research, some general remarks shall be made on beforehand. There is a wealth of studies conducted, whereas a large part of those were published in the eighties and after Fukushima. Those studies analyze media content, but several studies also focus on the public opinion on nuclear energy and risk perception of nuclear energy. The main focus in this research review will however lay on conducted content analyses. The review does not aim at being exhaustive, neither regarding the conducted studies nor regarding all different results that have been made. Instead it aims at discuss studies that can supply knowledge on risk depiction as well as phases and other important aspects to consider in this study.

The field dealing with media coverage of nuclear energy is international. However, there seems to have been little communication science research in Europe before and immediately after the Three Mile Island accident, an accident which in comparisons triggered quite some research in the US. After the accident in Chernobyl however, which was not only geographically closer to Europe, but also affected European countries with ionising radiation fall out and was the most severe accident until Fukushima happened, several European studies also occurred. Some studies also compare the media coverage of the two accidents. A high level of research attention was as well given to the accident in Fukushima. This study is one triggered by the accident, but it is by far not the only one.

With an eye on the to be suggested phase model, this chapter will for a better overview first rather concentrate on studies that have mainly or at least included *calm* or routine phases of nuclear energy coverage, that is, not studies dealing only with media coverage of accidents. Following that, studies will be discussed that have focused the more *hot* phases, those occurring after large accidents.

Author(s)	Year	Design
What happens in the media when nothing much happens in the plants?		
Rubin & Cunningham	1979	Content analysis of US media, TMI, 1979
Shirley van Buiren	1980	Content analysis of German newspapers, 1974-1977
Friedman	1981	Content analysis of US media, 1979
Mazur	1981	US public opinion and media coverage, 1950-1980
Friedman	1986	Content analysis of regional US newspapers, 1977-1979
Saxer et al.	1986	Content analysis of Swiss newspapers, 1976-1980; and TV and radio, 1981-1982
Kepplinger	1988	Content analysis of German newspaper coverage, 1965-1986
Gamson & Modigliani	1989	Frame analysis US TV and newspapers, 1945-1989
Doyle	2011	Critical discourse analysis of UK newspapers, 2005-2008
Arlt & Wolling	2014	Content analysis of German newspapers and TV; and public opinion, summer 2010 and spring 2011.
What happens in the media when nuclear fission gets out of hand?		
Stephens & Edison	1982	Bias analysis of US news organizations' coverage, one week after TMI
Teichert	1987	Content analysis of German newspapers and TV, interviews with newspaper and TV journalists, 2.5 weeks after Chernobyl
Rubin	1987	Comparative information flow analysis in US newspaper coverage, immediate time after TMI and Chernobyl
Friedman, Gorney & Egolf	1987	Content analysis of how US newspapers and TV report on radiation, two weeks after Chernobyl
Friedman, Gorney & Egolf	1992	Bias analysis of US newspaper and TV coverage, two weeks after Chernobyl
Cantone, Sturloni & Brunelli	2007	Content analysis of Italian newspapers, one month after Chernobyl
Friedman	2011	Comparing US news coverage in general after TMI, Chernobyl and Fukushima (no empirical data to Fukushima)
Perko	2012	Content analysis of newspaper coverage, ten days after Slovenian incident 2008 (14 countries) and two months after Fukushima (Belgian newspapers); and public opinion in Belgium and Slovenia
Weiss, Markutzyk & Schwotzer	2014	Key event and focusing event analysis in German newspaper and TV, four months after Fukushima
Fretwurst	2014	News values analysis in German newspapers and TV, four months after Fukushima
Schwarz	2014	Frame analysis in newspaper coverage (Germany, UK, India, Japan, Singapore and US), four months after Fukushima
Kristiansen & Bonfadelli	2014	Content analysis of Swiss newspapers, one year after Fukushima
Nienierza	2014	Framing comparison analysis in German newspapers, six weeks after Chernobyl and Fukushima
Note. This list of studies is not exhaustive, it is a chronical overview of the here discussed studies.		

6.1. What Happens in the Media When Nothing Much Happens in the Plants?

In this chapter I will turn to some studies that have analyzed the early days of media coverage of nuclear energy aiming to capture a historical background on how nuclear energy has been treated by the media before the big accidents happened. Other studies that will be discussed have also dealt with more recent coverage in routine phases where no accident happened. Some of the discussed studies do however additionally also deal with accident coverage.

In their much cited study **Gamson and Modigliani (1989)** give an analysis of media coverage of nuclear energy from 1945 to 1989. Their analysis deals with the construction of meaning through the relationship of media discourse and public opinion regarding nuclear energy. To depict this construction they analyzed TV and newspaper coverage of nuclear energy and thereby concentrated on four different media contexts being TV news coverage, newsmagazines accounts, editorial cartoons as well as syndicated opinion columns over the time span of 44 years. They sampled shorter time periods inside this long time span with help of Chilton's (1987) so called critical discourse moments, which are initiated by an event on the topic, which is identified by journalists and used by them to start a long-term coverage and discussion of the topic. They would identify a critical discourse moment by for example the so called "Atoms for Peace" speech by President Eisenhower 1953 and sample the weeks after the speech. The triggered media attention by events like this, provides a period in which the framing of the issue becomes more visible than at other times (Gamson & Modigliani, 1989, 11; 13)³⁰. By analyzing the media discourse on nuclear energy they want to better understand the formation of public opinion on nuclear energy and the changes it has gone through during this time span (Gamson & Modigliani, 1989, p. 1). The authors however make clear that they do not intend causality leading from the news media influencing the public opinion solely, but they understand the media coverage and the public opinion as mutually interacting instances. Instead, they want to describe the changing media discourse on nuclear power, which description can help understanding and interpreting the public opinion on nuclear energy (Gamson & Modigliani, 1989, p. 2). In order to describe the media discourse the authors chose to look for what they call media packages, or frames, which for them are a package of interpretation that gives meaning to an issue (Gamson & Modigliani, 1989, p. 3). As they make clear, a frame in their understanding is not giving a clear position pro or contra an issue. Inside of a frame there can exist disa-

³⁰ The concept of critical discourse moments by Chilton (1987), are very similar to the concepts of key event and trigger event discussed in chapter 5.

greement (Gamson & Modigliani, 1989, p. 4), therefore I consider frame analysis and political bias analysis as different measurements.

Gamson and Modigliani found that there was no anti-nuclear discourse in the media during the time period from 1945 until the end of the sixties, in the small amount of discussion of the topic of nuclear energy the progress frame was the only one (Gamson & Modigliani, 1989, p. 15). In the seventies, the media interest for nuclear energy awakened and media coverage of the issue arose and intensified after the nuclear accident in Three Mile Island in 1979 (Gamson & Modigliani, 1989, p. 17). The discourse was not only intensified, but it also became mixed with a second flavour, which was not an anti-nuclear frame, but it became clear that the usage of nuclear energy represented a controversial question (Gamson & Modigliani, 1989, p. 21). The ambivalence continued after the nuclear accident in Chernobyl but now, the media coverage was somewhat more clearer against nuclear energy (Gamson & Modigliani, 1989, p. 30). The authors conclude that people who had experienced the clear progress frame in favor of nuclear energy before accident in Three Mile Island were rather to be ambivalent in their opinion on nuclear energy whereas the people who did not experience the overall positive assessment of nuclear energy but only the ambivalence or contra opinion after the accident might have been less ambivalent in their opinion and more often against the usage of nuclear energy. By showing how the same survey questions can capture pro, ambivalent and contra opinions independently of what the person answers to certain questions, show that one can be helped by looking at the media framing if wanting to understand the public opinion (Gamson & Modigliani, 1989, pp. 34–35).

Kepplinger (1988) conducted a similar analysis to the one of Gamson and Modigliani (1989) when he analyzed German newspaper coverage of nuclear energy topics also over a long time period of 21 years from 1965 to 1986, so also including the two nuclear accidents of Three Mile Island and Chernobyl. He chose to analyze seven different newspapers and newsmagazines and sampled 13 editions per news outlet per year. In his sample of 2002 editions he looked at only the four first pages of the political part of the dailies and the whole political part of the magazines and analyzed assessing statements on nuclear energy. Kepplinger asked a similar question as Gamson and Modigliani did when he was interested in finding out what media coverage looked before and after the nuclear accidents (Kepplinger, 1988, pp. 659–660). Kepplinger's analysis showed that in the end of the sixties already, which was before the accident in Three Mile Island, the German news coverage of nuclear energy changed and started to become more negative. Before that the coverage was however clearly positive tuned. So similar to the results of Gamson and Modigliani, there was positive coverage at first, which in Germany however changed to be rather negative even before the accident on

Three Mile Island. This was not the case in the US media coverage; as Gamson and Modigliani demonstrate, even after Three Mile Island, it did not turn purely negative, it became, however, controversial (Gamson & Modigliani, 1989, p. 21). Kepplinger states that the German press was already writing negatively about nuclear energy when the nuclear accidents in Three Mile Island and Chernobyl happened. He argues that because the press was already negatively biased, the accidents were manifest events used to emphasize the negativity of the technique. Likewise, he points out that the existing negativity was a reason for the intense media coverage of the accidents, and not the other way around (Kepplinger, 1988, pp. 663–664). Kepplinger however did not search for frames, but through the analysis of statements and their bias he found that the different newspapers he coded showed clear left-right tendencies. The more left the newspaper was, the more negative statements were depicted and the more right the newspaper the more positive were the statements to nuclear energy (Kepplinger, 1988, pp. 660–661). This is something he calls instrumental actualisation, which means that the political slant of the newspaper will decide which actors the journalist let speak in the coverage. This intentional or unintentional search for actors, who will support the political bias of the medium, in the statements that they will make is the instrumentation that he speaks about (Kepplinger, 1988, p. 678). Further he argues that the issue of nuclear energy is highly politicised. This was also shown in the actors making statements in the press coverage, as they in 43 percent of the cases were politicians and the next following category of actors were journalists making 26 percent of the statements. However, I want to point out that it is expectable to find many politicians speaking in the political part of the newspapers and the magazines, which was the only part of the newspaper considered in Kepplinger's analysis. That only between ten to eleven percent of the assessing statements were made by scientists might also have to do with the fact that the analysis focus was laid on evaluating statements and scientists might be avoiding or at least be expected to avoid making assessments. Additionally Kepplinger found out that in half of all newspaper articles the aspect of detriment was mentioned but only in every fourth article the benefit of nuclear energy was mentioned. However, the mentioning was highly speculative as the *possible*, rather than the actual detriment and benefit were in focus (Kepplinger, 1988, pp. 660–661). This also ties in with the finding of the most often mentioned topic in the statements being the radioactive radiation after the accident in Chernobyl (Kepplinger, 1988, p. 678). By covering the radioactive radiance to that extent Kepplinger (1988, p. 672) means that the German press gave a new perspective to the media coverage of nuclear energy after the nuclear accident in Chernobyl. Before the accident in Chernobyl, radioactive radiance was only rarely a topic and when it was mentioned as for example after the nuclear accident in Three Mile Island, it disappeared quite fast again. But after Chernobyl the detriments caused by radioactive radiance and

radioactive radiance caused by potential accidents in German nuclear energy plants were mentioned more often than before the accident.

Another study looking at a long time span in the early days of nuclear energy production is the study of **Mazur (1981)**. In his study of media coverage and public opinion on scientific controversies, he looks at how the public opinion changes and compares it to the amount of media coverage at the same time on issues, which in his article are the issues of fluoridation and nuclear energy. In this article, it is interesting to see how the media covered nuclear energy from the fifties and onwards to 1980. According to him American mass media covered nuclear energy a lot in the mid-fifties when the first nuclear power plants were taken into use. At this time the American president Eisenhower had a program called “Atoms for Peace”, which encouraged the development of nuclear reactors for civilian usage. At this point the news coverage on nuclear energy was all positive. According to Mazur, this changed in the sixties, perhaps due to the atomic bomb testing which resulted in radioactive fallout and concern in the population. Those were events that also lead to more media attention to nuclear energy plants, which rose even more in 1968, as activist groups started to intervene against nuclear power plants. This triggered more media coverage and at the same time polling data showed that the percentage of population that was opposing nuclear energy also rose. As Mazur shows, the measure of media attention to nuclear energy is mirrored in rising and sinking opposition in the population. Due to the nuclear accident in Three Mile Island of course media coverage as well as the percentage of opponents on nuclear energy both rose, but fell of quite quickly (Mazur, 1981, pp. 111–113). The high media attention given to the Three Mile Island accident was according to Mazur not only triggered by the accident itself, but also by the fact that the nuclear catastrophe movie “The China Syndrome” was ironically released in the cinemas just days before the Three Mile Accident (Mazur, 1981, p. 115). Whoever who has seen the movie and imagine the newspapers writing about a real nuclear accident the next day can imagine the fear one would feel at that time.

However, Mazur concludes that since the support for nuclear energy recovered within two months after the Three Mile Island accident this might have been due to the at the same time decreasing mass media attention given to nuclear energy. He is able to show the same trend for the issue of fluoridation, which was another controversy in the population and discussed by the mass media. Even when the media coverage is not negatively biased against fluoridation the public opinion clearly show a more sceptical population. Therefore, Mazur concludes that the public has a conservative bias when they have heard about a controversy like fluoridation, nuclear energy or nuclear waste storages even if the media coverage was not negatively biased. Also because as he points out

parts of population that in a survey had not heard about the nuclear waste storage at all was much less opposed to it than the parts of population that had heard about it. The public seems to rather wanting to be safe than sorry (Mazur, 1981, pp. 113–114). So the early days of nuclear energy, at least in the US, the media coverage of this technique was positive. This changed due to nuclear bomb testing as well as to the accident on Three Mile Island. Interestingly public opinion seems to be due to as much fluctuation as media attention and at that time seem to be able to recover from dips pretty easy. Interestingly the negative media coverage that Mazur saw in the US in the sixties, Kepplinger (1988) registered in Germany as well. In his study of media coverage of nuclear energy from 1965 to 1986, he pointed out that the media coverage became negative even before the first accident of Three Mile Island had occurred. He pointed to this fact as being one reason why the nuclear accidents, both Three Mile Island and Chernobyl, were triggering so much media attention. As nuclear energy was already negatively biased, the accidents were *proofs* used for journalistic emphasizing (Kepplinger, 1988, pp. 663–664). An interesting question in this specific context would be if this shift was triggered by the media or by opponents of nuclear energy.

Turning to another early study that purposefully looked at triggering events, not accidents, is that of **Shirley van Buiren (1980)**. She chose two nuclear controversies being discussed in Germany between the spring of 1974 and 1977 in order to analyze the nuclear debate when it becomes a public debate and not one that only experts participate in and follow. This would, according to Downs (1972, p. 39), be the transfer from the *pre-problem stage* into the *alarmed and euphoric enthusiasm stage*. The debates that she chose were about two nuclear sites in Wyhl and Brokdorf in Germany, where it came to massive protest. According to van Buiren, these two events were covered carefully by the German press, even more than some nuclear incidents (Buiren, 1980, pp. 115–116). The author conducted a content analysis of 2047 articles on nuclear energy sampled from five German newspapers during the time period of three years. Amongst other things, she analyzed statements and the topic of them as well as their tone, if they were biased in favor, against or speaking neutral about nuclear energy (Buiren, 1980, pp. 119–121). The bias of the text and the article title were distinguished and the results showed that there were more statements biased against nuclear energy in the text of the articles, whereas the statements in favor of nuclear energy were predominant in the titles of the articles (Buiren, 1980, p. 124). She also analyzed pieces of information given in the statements and which information was used to argue against or in favor of nuclear energy. The results showed that when the information was in favor of nuclear energy, the most mentioned information was that the risks of nuclear energy are acceptable. However, this was also the most used information when the information was biased against nuclear energy; of course, the information was that the risks are not acceptable

(Buiren, 1980, 126; 128). This result shows that the press coverage was highly engaged in discussing the risk of nuclear energy, which is an important aspect when discussing where to build or rebuild a nuclear power plant. The study also showed which actors made the pro and contra statements. It showed that the statements with a negative bias to nuclear energy mostly came from citizens and the pro statements mostly came from politicians (Buiren, 1980, p. 130). Besides the conclusion that Buiren made that pro statements are presented prominently and were fact based and carried by prestigious society members more often than the contra statements that are more hidden, although present more often and dealing with concrete risk, she also claimed that over time, the media coverage showed to be strongly depending on events and became more and more negative as time passed (Buiren, 1980, p. 115). Those are interesting results showing the connection between tendency (negative or positive) of statements with the stating actor. The question seem relevant, who are the actors presenting which dimensions of risk? It would be interesting to find out if it is still the case that more prestigious members of society are covered favoring nuclear energy, assuming citizens in general might give more importance to such persons. And, are negative statements on nuclear energy increasing also after Fukushima or are they rather decreasing as the accident becomes increasingly distant? Buiren's result that those two political protests against nuclear sites were even given more media attention than nuclear accidents is also interesting to take into account. Given this, it would be important to study not only a short period after an accident, but also aim to capture the following political controversy and discussion. This phase might carry important aspects for the Risk Attention Phase Model.

After the Three Mile Island accident in 1979, American communication scientists were not positive about the communication performance during and after the accident. They even called it a “massive communication[s] breakdown” (Friedman, 1981, p. 116). There was a task force set in up in the US by the President's Commission in order to investigate this communication catastrophe, which was called “**Public's Right to Information Task Force**” (Friedman, 1981, p. 116; Rubin & Cunningham, 1979). The group was put together by 14 communication scientists and information specialists³¹; **Sharon Friedman**, who after that has published prominently in the research field on nuclear accident communication, was one of the members in the task force. The report that resulted out of the work of the task force is a detailed assessment on the work of public information officials and journalists before and after the Three Mile Island acci-

³¹ The 14 members of the task force were: David M. Rubin, Holly A. Chaapel, Ann Marie Cunningham, Nadyne G. Edison, Mary Beth Franklin, Sharon M. Friedman, Wilma I. Hill, Nancy C. Joyce, Roy S. Popkin, Peter M. Sandman, Mitchell Stephens, Mark C. Stevens, Patricia E. Weil and Emily D. Wells (Rubin and Cunningham (1979)).

dent and has also been due to several following scientific publications by members of the task force, some of which are also discussed in this research review. The task force analysed several aspects: past media coverage of previous nuclear accidents; information given to the population on the nuclear plant of Three Mile Island before the accident; the performance during the accident of public information officials; and there were also interviews made with journalists as well as media coverage content analysis, which captured content, quality and tone of the coverage (Rubin & Cunningham, 1979, pp. 2–3). The general result of these analyzes was that people's right to know about what was going on at the nuclear power plant had not been served well by the operator of the nuclear power plant, which was Metropolitan Edison (also called Met Ed). But also the Nuclear Regulatory Commission (NRC) and many of other institutions involved in the accident were given bad grades on their performance (Rubin & Cunningham, 1979, p. 15). As Friedman concludes, causes for this bad communication situation was bad planning, no one was expecting an accident like this and also miscommunication between engineers and journalists, which is a mixture that Friedman compares to the mixture of oil and water (Friedman, 1981, p. 117). It was also the first accident of this size that media had to cover while it was happening. All incidents before Three Mile Island had been small and not known to the media before they were over (Rubin & Cunningham, 1979, p. 1). And there was no one at the plant who was in charge of the communication needed in an emergency situation (Rubin & Cunningham, 1979, p. 6). But also before the accident happened there were problems in the communication flow and media coverage of nuclear energy. **Friedman (1986)** conducted a study of regional newspaper coverage in Harrisburg from 1977 to before the accident in 1979. The two regional newspapers published 60 articles on nuclear energy in this time. The most prominent topics were licensing hearings and events regarding safety and the power plant (Friedman, 1986, p. 191). This small number of articles were regarded as a "generally good level of coverage of major TMI issues" by Friedman (1986, p. 190). Broadcasting media however did only show minimal attention to Three Mile Island before the accident happened (p. 193). Even though the regional press did cover news from the power plant, comparing the media coverage to the weekly press releases by the nuclear operator Met Ed, she claims that the media did not adequately cover the events communicated in the press releases. She argues that the readers might have known that the power plant had some problems, but since the journalists did not add much depth to the coverage and rather emphasized the legal situation, recipients might not have been very well informed (Friedman, 1986, pp. 190–191). Friedman concludes that the media coverage as well as the communication efforts of Met Ed "helped set the stage at TMI for a communications breakdown during a serious accident" (Friedman, 1986, p. 197). In addition to that Friedman points to that the information and press releases that on a

regular basis were provided by the operator Met Ed before the accident already showed the problem of experts not being able to communicate in a way that a layperson will understand. Even most specialised journalists would have difficulties in understanding their terminology and they felt frustrated about the information provided (Friedman, 1981, 119; 121). The newspapers and the journalists in the area around the Three Mile Island plant wrote mainly positively about nuclear energy before the accident, and their coverage was mostly financially slanted coverage than reporting of the nuclear technique (Friedman, 1981, p. 121). In general, the news media provided more reassuring than alarming statements during the accident coverage except when it came to a possibly meltdown, where the coverage was more alarming. Journalists were also not positive about the future of nuclear energy (Rubin & Cunningham, 1979, p. 12). After the accident many newspapers paid more attention to being able to cover nuclear energy properly and some assigned a full-time reporter to cover nuclear energy or general energy issues (Friedman, 1981, p. 123).

To the best of my knowledge, only one big study has been conducted on the mass media coverage of nuclear energy in Switzerland, which was combined with interviews of journalists. It is the study of the author team **Saxer, Gantenbein, Gollmer, Hät-tenschwiler and Schanne (1986)**, who analyzed newspaper articles³² over the time period of 1976 to 1980 and television and radio coverage from the middle of 1981 to the middle of 1982 that covered nuclear energy (Saxer et al., 1986, p. 290). Their newspaper sample included 16 newspapers published in the German language (Saxer et al., 1986, p. 68). From all articles dealing with nuclear energy, they sampled 6000 news features that had a clear relation to Switzerland (Saxer et al., 1986, 170; 290). The time period sampled includes the nuclear accident at Three Mile Island in 1979. The question that the authors asked was if the Swiss media system was able to deal with the complex technique and cover it in a way so that citizens were well informed. They argued that the media has an important role in a democratic state when dealing with difficult subjects. As they state themselves, the data that they collected is mostly descriptive, but gives a good overview of how Swiss media dealt with nuclear energy at that time. The theoretical approach that forms the basis of the study is the one of news values (Saxer et al., 1986, p. 289). Looking at the overall prominence of the nuclear energy discourse in all of the newspaper articles (i.e. before the sampling of the 6000 articles) in the newspapers over the years, there are some differences to be noticed. 1976 was the year with the least media coverage of the topic with 3174 newspaper articles in all 16 newspapers. 1979 had the most articles with 8262 articles. 1977, 1978 and 1980 all had around 5300-

³² Saxer et al. analyzed newspapers, radio and television articles only published in German Saxer et al. (1986, p. 290).

5600 articles. If looking at only the number of articles published in the three largest Swiss newspapers *Blick*, *Tages Anzeiger* and *Neue Zürcher Zeitung*, *Blick* published the fewest articles of these three newspapers, with only 397 articles over all five years. *NZZ* published the most with 2328 articles and *Tages Anzeiger* was not far away with its 2198 articles over the five years. In the Three Mile Island accident year however, *Tages Anzeiger* had more articles than *NZZ*. *Tages Anzeiger* published 710 articles in this year whereas *NZZ* had 601 articles on nuclear energy. Looking at all of the other 16 newspapers, the *Basler Zeitung* was the one with the most articles over all of the years as it published all in all 3672 articles (Saxer et al., 1986, p. 68). Seeing the heavy focus of the newspaper seated in the city of Basel, might point to the fact that the city of Basel is geographically nearer to the Swiss nuclear power plants than the three biggest newspapers, which are all seated in Zürich. The geographical distance from the existing nuclear power plants, as well as the closeness to the two plants of Gösgen and Kaiseraugst in planning might have influenced the media coverage (Saxer et al., 1986, 66; 117). When looking at the more detailed analysis, one can see that the month with clearly the most coverage (circa 1600 newspaper articles) over the five years, was February 1979, thus before the accident in Three Mile Island. In February 1979, however, there was an attack on and detonation of the information stand of the planned nuclear power plant Kaiseraugst, which was due to a heavy controversy in Switzerland. In the same month, there was also a voting on a political initiative of a stricter Swiss nuclear energy law (Saxer et al., 1986, p. 167). Since the nuclear power plant building site of Kaiseraugst is close to Basel, it is to be concluded that this was the trigger event of the overall heavy media coverage in that month, which resulted in an even heavier coverage than after the nuclear accident in Three Mile Island two months later. However, the conflict about Kaiseraugst would be a clue to why the *Basler Zeitung* is the newspaper with the most articles of all the 16 analyzed. This conflict was highly controversial in Switzerland and accompanied by many protests. After looking at some of the results on the number of articles over time and in the different newspapers, I want to focus on the topics that the authors analyzed. As they analyzed the topics the news articles were dealing with, they used a topic catalogue of nine different topic groups, which included a finer subdivision of the topics (Saxer et al., 1986, pp. 148–149). The topic that was clearly mentioned the most was energy policy actions. In 37 percent of all 6000 newspaper articles, this was one of the maximal six coded topics per article (Saxer et al., 1986, p. 151). Therefore, the authors argue that the discourse on nuclear energy was a political discourse (Saxer et al., 1986, p. 150). In comparison, the next most mentioned topic was the public opinion which was found in 15 percent of all newspaper articles (Saxer et al., 1986, p. 151). The placement of the nuclear discourse in the newspaper also shows a political stance, as most articles were published in the political section of the newspa-

pers (Saxer et al., 1986, p. 150). The political and legal perspective of nuclear energy was clearly in focus compared also to the economic and scientific perspectives, which were mentioned much less. The authors summarized several sub-topics into the categories of policy and law, economy, science and technique and nature. Of all of the topics mentioned, policy and law account for 75 percent, economy for nine percent, science and technique for twelve percent and nature for four percent (Saxer et al., 1986, p. 155). On the radio and on television, the difference between the most prominent topic and the second most prominent was much smaller. In both news outlets, the political aspect was the most prominent. In the radio, it was mentioned in 17 percent of the broadcasts and the second most prominent topic was public opinion (Saxer et al., 1986, p. 159). On television, however, the political discourse was mentioned in 24 percent of all broadcasts and the second most popular topic was information and nuclear energy, which was mentioned in twelve percent of the news (Saxer et al., 1986, p. 160). Regarding the progression of the topics over the five year period, there were only two months in which the energy policy actions were not the most prominent topic. In all of the other months, the discourse was always clearly a political one. Other topics that were also present over the whole time with small fluctuations were: energy need and use prognoses; firm activities in the nuclear energy sector; political opinion on nuclear energy and information and nuclear energy (Saxer et al., 1986, p. 162). We see in this study that nuclear energy was a topic that was dealt with under political stance in Switzerland. The accident in Three Mile Island was of course also covered, but since the authors only sampled articles with a relation to Switzerland, many of the Three Mile Island accident articles are expected to have fallen out of the content analysis. Under the same aspect, it was interesting to see how vividly the nuclear discourse was going on being a trigger of a large amount of media coverage.

In reference to these older studies that include phases before accidents, it can briefly be summarized that the very early days of nuclear energy was followed by positive media attitudes. It was a political discourse as politicians were the main statement makers in the media discourse. Caused by nuclear accidents and political protests in some countries, the media increasingly reported negatively about nuclear energy. As discussed in chapter 3, it is to be assumed that the negativity decreased at one point and the general climate became rather positive around mid- or end 2000. To confirm this, two more recent studies shall be discussed to see what the state was before Fukushima happened.

A more recent study analyzing three UK newspapers during the time period from end 2005 to early 2008, is a critical discourse analysis of 465 articles by **Doyle (2011)**. This was a phase of political activities regarding nuclear energy in the UK referred to as the *UK Energy Review*, as nuclear energy was to play a role in reducing carbon emissions

and was reframed by government as a way to tackle climate change. The study Doyle conducted was interested in the media coverage of this issue that also meant new nuclear plants being built. Did the media support or challenge this issue (Doyle, 2011, 107–109; 112)? The results of the study of the three newspapers do not show a clear uniform pattern across the news outlets as they tend to focus on different aspects of the debate. They do however more or less reproduce the official discourse and across time the opposing of nuclear energy is decreasing in the newspapers (Doyle, 2011, pp. 121–122).

In the recent German study by **Arlt and Wolling (2014)**, the authors analyze changes in media coverage and opinion on nuclear energy triggered by the accident in Fukushima. They analyze media coverage in seven German newspapers and TV newscasts in two periods. The first period of almost three months media coverage was in mid-July to early-August 2010 ($n = 259$). This was a period shortly before the German Bundestag voted about a run-time extension. The second period also covered three months directly after Fukushima, mid-March to mid-May ($n = 243$). If focusing only on their interest in media coverage change, they were interested to find out if Fukushima triggered other topics to be due to attention and if there would be a change in the tendency (pro or against) nuclear energy in actors statements (Arlt & Wolling, 2014, pp. 277–279). Their analysis shows that after the accident the media mentioned the topic risk and safety clearly more often (59 percent) than before the accident (36 percent). Instead, the topic economics was mentioned significantly less after (53 percent) Fukushima than before (73 percent). Other benefits that were mentioned significantly more often before the accident were energy supply, environmental sustainability (Arlt & Wolling, 2014, pp. 281–282). According to those results, there seems to be a focus on the benefits of nuclear energy before the accident, which then however does not vanish completely but gets ruled out by the most mentioned topic of risk and safety. Regarding the actors present in the media coverage, no larger changes were observed. Politicians were the actors that were most present before (54 percent) and after (45 percent) the accident. Yet there was a clearer change in the position of the actors. Before the accident 31 percent were against a run-time extension (i.e. against nuclear energy) and after the accident 73 percent wanted a nuclear phase-out (i.e. against nuclear energy) (Arlt & Wolling, 2014, pp. 282–283).

6.2. Interim Conclusion of Nuclear Energy Studies in Routine Situations

To conclude the discussion of those studies, we learn from Gamson and Modigliani (1989) that the US media coverage of nuclear energy from 1946 until the accident on Three Mile Island was sparse, did not cover an anti-nuclear discourse and had a progress frame. With the progress frame being prominent one can assume that the benefit

of nuclear energy was focused. Which also mirror Friedman's (1981) result that the US media covered nuclear energy positively before Three Mile Island. Additionally she discovered that the coverage was rather economically slanted, which goes well together with the progress frame that Gamson and Modigliani (1989) found. However, she rates the communication flow from the nuclear operating companies to the journalists as not optimal. The problem of expert lay communication was visible and this caused understanding problems (Friedman, 1981, 119; 121). In Germany however Kepplinger (1988) discovered that in the end of the sixties media coverage became a negative bias against nuclear energy. Until that, it had been rather positive and like in the US also sparse. Kepplinger points to what seems to be a turning point in 1974 where media attention rose and the negativity in the coverage became stronger and in the time span of his analysis never became positive again (Kepplinger, 1988, pp. 664–665). When looking to Buiren's (Buiren, 1980) results from analyzing the period 1974 to 1977 the result of Kepplinger becomes clearer, this was a time of massive protests against new nuclear sites in Germany. An issue that got even more media attention than some nuclear accidents (Buiren, 1980, pp. 115–116). This was also a time when the risk of nuclear energy production was controversially discussed (Buiren, 1980, 126; 28). The negativity seemed, however, considering the results of Arlt and Wolling (2014), to have changed until shortly before Fukushima. At least the German Parliament discussed and decided a run-time extension in 2010 and topics pointing to that the benefit of nuclear energy were discussed by the media were to be seen in their analysis (Arlt & Wolling, 2014, 270; 282). This trend was also to be seen in the Swiss political activities at that time, but it remains an empirical question to see how the media depicted this phase.

The Swiss Study also showed that there was a rather sparse media interest in nuclear energy in 1976, which grew somewhat in times where political referenda on nuclear energy were held or when attention turned to the protests in Kaiseragust. As Kepplinger pointed out in the German media coverage until 1986, and Arlt and Wolling (2014) still found in 2010 and 2011, also the Swiss coverage was mostly presented out from a political perspective or having mostly political actors making statements in the media coverage (Arlt & Wolling, 2014, p. 282; Kepplinger, 1988, p. 161; Saxer et al., 1986, pp. 164–168). So we see, nuclear energy has had an increasing attention curve over time, been due to different presentations in different country contexts and being influenced by present political climate. In the next step it shall be discussed what studies have revealed what media coverage looks like when an accident occurs.

6.3. What Happens in the Media When Nuclear Fission Gets Out of Hand?

This chapter will discuss studies that have dealt with the *hot* phases of nuclear energy media coverage. Those are mainly studies that have analyzed how media deal with nuclear accidents.

The first study to discuss is a further study that followed out of the work of the previously mentioned task force, namely the article of **Stephens and Edison (1982)** who, in their content analysis of ten top US national news organizations (for example ABC, New York Times and others), looked for bias and balance in the news media coverage of the Three Mile Island accident coverage during the first week after the accident was declared as one (28.03.1979-02.04.1979) (Stephens & Edison, 1982, p. 200). They coded two issues, the one of health and safety and the one of nuclear energy. Inside those two issues they distinguished different topics, like the ones of “status of the accident” and “radiation exposure” regarding the health and safety issue, and the ones of “nuclear energy” and “future of nuclear energy” and other topics regarding the issue of nuclear energy that were of significance to the political discussion of nuclear energy. The health and safety topics were distinguished as alarming and reassuring and the nuclear energy topics were distinguished as negative or positive. The results showed that the issue of health and safety and its topics were covered more often (71 percent) than the one of nuclear energy (29 percent) and the most prominent topics were the one of the hydrogen bubble, the chance of meltdown, the information on the accident and the threat of danger. In general it showed a media coverage that, independently of the issue, was reassuring or positive (64 percent) and looking at the two issues separately the health and safety issue was mainly reassuring (76 percent) and the nuclear energy issue mostly negative (65 percent). However, the negativity of the issue of nuclear energy was much due to the negative evaluation of the information on the accident (Stephens & Edison, 1982, pp. 201–202). The future of nuclear energy was clearly questioned and rather rated negatively whereas the necessity of nuclear energy was also discussed and rather positively rated (Stephens & Edison, 1982, p. 203). The authors conclude that the coverage of issues with potential political influence and consequences was balanced, even if the whole coverage was due to a nuclear accident. There were more negative statements published on these issues, but most of them dealt with the politically not so important question of the quality of the information in the accident situation. Overall, the coverage was reassuring rather than alarming (Stephens & Edison, 1982, 204; 259).

With regard to 1986 and the accident in the USSR, Chernobyl was a difficult case for the media because the information was sparse and difficult to get to during the accident. This was due to a restrictive information policy in the Union of Soviet Socialist Republics (USSR). Teichert cites a journalist that said if the media coverage seemed chaotic

and caused confusion the media did a good job in imparting how the situation really was, because this was how the situation was, also for the media, it was not something they made up or staged (Teichert, 1987, p. 186). **Teichert (1987)** is one of the researchers who analyzed how the media in Germany treated the catastrophe. In his research he conducted interviews with TV and newspaper journalists as well as a content analysis of available TV newscasts and newspaper articles during two and a half week after the accident (during the time period from the 29.04.1986 to the 15.05.1986, whereas only newscast from seven days during this period were analyzed). With the content analysis, he wanted to systematic specify what the topics of the news coverage were and how they developed and changed during this time period (Teichert, 1987, pp. 187–188). During the seven days analysed, Teichert found 575 news articles to Chernobyl. Inside these, a range of topics were mentioned and resulted in 2054 different cases. The most common topic was the radiation level which was mentioned in 78 percent of the articles. However, only in four percent of the newscasts the radiation level was mentioned as being dangerous. In 42 percent of all news casts the radiation levels were mentioned to turn back to normal levels or that the levels were not of any danger. The information policy was also a popular topic in 42 percent of the news, which was negatively criticized. In 38 percent reactor safety was mentioned and in almost all cases where a judgement was presented (this was the case in ten percent of all news casts) those were calming, saying that the safety standard was high enough. The topic of a nuclear phase-out was mentioned in 24 percent of the articles and in seven percent these were in favor of a phase-out. Negative statements to a phase-out only came in 2 percent of all newscasts. Economic consequences were not a very prominent topic and only mentioned in 18 percent of the articles. (Teichert, 1987, pp. 192–193). Teichert also analyzed which actors were cited or paraphrased in the news casts and found out that in almost 60 percent of the articles there was an actor from Germany and these were in many cases politicians. Teichert argues that this was due to the difficulty of legitimation of nuclear energy that was brought up by the accident and that politicians now had to make statements. The next biggest group of actors were scientific experts (Teichert, 1987, pp. 197–199), and the combination of the two makes it clear that the situation was one of orientation. Expert statements were needed in order to estimate the situation and the political statements were needed to legitimize the use of nuclear energy and also maybe to show in which direction the future of nuclear energy usage was to go. In comparison actors from the industry and economy sector were only let to speak in half as many cases as scientists and experts. This legitimation was needed, as Teichert argues when discussing a public poll of how the public opinion in Germany changed dramatic due to the accident. Before the accident 52 percent were in favor of nuclear energy and after the accident 29 percent were still in favor. Against the usage were 46 percent before the

catastrophe and afterwards 69 percent³³ (Teichert, 1987, p. 199). Teichert's study shows that the information policy was foremost the victim of critique in the German media coverage of Chernobyl. The radiation levels, as they were relevant to some regions in Europe, made out for the most prominent topic, but not in the sense of making people panic. The short time period that was analyzed did not provide a good overview over how the topics changed over time. However interesting to see was even though the accident was very severe, the media did not show a heavy anti-nuclear energy bias. This might have been because the severity of the accident was not yet graspable and or not communicated.

Another European single country study also dealing with Chernobyl, is the study of **Cantone, Sturloni and Brunelli (2007)** analyzing the Italian press coverage during one month after the Chernobyl accident. Italy is an interesting country to look at in the case of nuclear energy, because in a referendum in November 1987 three laws concerning nuclear energy were repealed. This referendum result was interpreted by the government as a public opposition to the technique, which resulted in a nuclear phase-out. This decision is seen as a result of the public debate that the nuclear accident in Chernobyl triggered. Therefore Cantone and her colleagues were interested in analyzing which stakeholders participated in the public debate in two leading newspapers, *Corriere della Sera* (conservative) and *la Repubblica* (liberal), that trigger a nuclear phase-out in Italy (Cantone et al., 2007, pp. 261–262). The one month sample of the study resulted in 566 articles. Besides their stakeholder analysis they also conducted a frame analysis as well and the most common frame was the health threat that was due to radioactive ionisation in north Italy. This frame appeared in one third of all newspaper articles. The second most common frame was the one on technology safety and risk. And a common argument of the articles was that the Western countries are superior in handling this technology. This frame was however only present during the first days of accident coverage. Looking at actors speaking in the newspaper coverage, the authors conclude that the issue was discussed by a broad public and not only experts (Cantone et al., 2007, pp. 263–264). The authors conclude that the Italian newspapers served as a public forum in which different voices with different political values were able to present their interests (Cantone et al., 2007, p. 266).

After the nuclear accident in Chernobyl Friedman, Gorney and Egolf conducted a content analysis of five American newspaper and three major television networks during the two first weeks after the accident, 28.04.1986 to the 12.05.1986. This research resulted in two articles which should be mentioned here. In **Friedman, Gorney and**

³³ Totals may not equal 100 percent because of rounding off.

Egolf (1987) the focus was on how the news media reported on radiation, health and environmental risks, and found out that the information on these topics that were provided were appropriate, but there was not enough information provided by the news media in order for people to evaluate the risks (Friedman et al., 1987, p. 78). In **Friedman, Gorney and Egolf (1992)** the researchers investigated bias in the US newspaper and TV coverage in order to find out how the nuclear industry was treated by news media the two following weeks after the severe nuclear accident in Chernobyl. This was because several critics claimed media was treating the nuclear industry unfair and reported negatively biased against nuclear energy and they wanted to find out if this was true (Friedman et al., 1992, p. 306). They found 394 newspaper articles in the five analyzed newspapers, most of them in the three quality newspapers they analyzed (*New York Times*, *Philadelphia Inquirer* and *Washington Post*). Most of the articles dealt with the accident itself and the released radiation and not so much with the nuclear industry or power in general. So even though Chernobyl provided an excellent opportunity to attack nuclear energy production the American news media did according to the authors not take advantage of the situation. Instead, as their research showed, the news coverage was even-handed, with only one newspaper being rather on the negative side in its reports on the accident. The authors had three measures of negative bias. They looked for attacks on or criticism of nuclear energy and the nuclear industry and found it in 19 percent of the newspaper articles. The second measure was if information was provided that claimed that changes had to be made in the nuclear industry and in 17 percent of newspaper articles this was the case. The third negative bias measure was analyzing whether or not there were calls for government regulations of the nuclear industry or nuclear energy in general and only in 9 percent of the articles claims like that were to be found. According to these measurements, there was no extreme negative bias to be found. Their research did not show a shift of focus from the accident to the nuclear industry in the US, only few of all articles focused the nuclear industry in the US (Friedman et al., 1992, 308-314; 321). This might have been due to the short time period they analyzed and to the slow information release in Chernobyl, so that the accident stayed in focus for a longer time. However in 23 percent of the newspaper articles there were references to past accident in the US and to safety records (Friedman et al., 1992, p. 310). Regarding statements in the articles, there was also almost no pro and contra bias to be found. Most of the biased statements were balanced in the same article by a statement from the other side (Friedman et al., 1992, p. 316). The authors conclude by criticizing the media for not providing enough explanations and background information in order to enable recipients to evaluate the nuclear industry (Friedman et al., 1992, p. 319). The study on radiation information (Friedman et al., 1987) also concludes that not enough information was provided by the media. They argue this might have caused an infor-

mation deficit in the public, information which could have influenced peoples opinion on nuclear energy (Friedman et al., 1992, p. 319). Therefore, they see the coverage of the Chernobyl accident as solely concentrating on events, like the one of an accident and argue that the media did not fulfil its information duty, since recipients rely on the mass media to get essential information, including information on risk carrying technologies. However the information that was carried out was mostly even handed and balanced without any political bias. Only the *Inquirer* was slightly negative in its coverage (Friedman et al., 1992, pp. 319–320).

After Chernobyl, there were also some researchers that started to compare nuclear accident media coverage. Those are interesting studies, however it shall be remembered that from 1979 to 1986, and more crucial from 1986 to 2011, many years passed and media coverage as well as the general societal and energy contexts evolved. **Rubin (1987)** is one of the researchers that conducted a comparative study of the two accidents Three Mile Island and Chernobyl, also relying on the Report of the task force (Rubin & Cunningham, 1979) and additionally on newspaper articles from a single American newspaper covering the accident in Chernobyl. In the discussion of this material, Rubin did not only show that information were given to news media within a few hours after the accident in Three Mile Island whereas the accident in Chernobyl did not reach the local media until one and a half day into the accident, but also that after that initial information it was difficult for journalists to get any further information at about the Chernobyl accident (Rubin, 1987, pp. 42–43). Also several other differences in information flow were observed comparing the two accidents, like the information coming from the people working at the plants, to politicians and press. One similarity between the accidents were difficulties handling the whole situation by all involved (Rubin, 1987, pp. 44–47). One of the biggest challenges in both situations seems to have been to establish a stable and correct flow of communication and information from inside the plant and accident area to the outside world (Rubin, 1987, p. 48). To provide information in general and correct information about radiation levels in particular seems to have been the big challenges in both accidents. Exactly this information could be crucial for people living close to the plants and to other affected areas (Rubin, 1987, p. 49). Another difficulty was the communication between experts and laymen. It was difficult to provide information about radiation that journalists and the public could understand. Therefore it was hard for affected people to estimate the risk they were exposed to (Rubin, 1987, p. 50). According to Rubin, nuclear accidents are very different from other disasters like earthquakes or hurricanes for journalists (Rubin, 1987, p. 52). The difficulty that radiation is invisible and needs expert measurements, interpretation and information makes journalists very much dependent on expert sources. Of course an earthquake also causes a chaotic situation but at least its detriment is visible for every-

one. In the situation of a nuclear accidents, as it is a risk taken by decision, there is also the element that there is someone to blame. “Nuclear power is an intensely political issue, so every source is speaking from some viewpoint” (Rubin, 1987, p. 53), which opens up for many to blame and many who want to calm down the situation. But not only the political side of nuclear energy set up a scene for different statements, also experts do not agree on the risk of nuclear energy which makes it even more difficult for journalists to see through and give clear coverage of the situation (Rubin, 1987, p. 53). In the light of Chernobyl and the held back information by the USSR, the accident in Three Mile Island and the so called communication catastrophe was not so bad (Friedman, 1981, p. 116). At least there was some information given out after Three Mile Island compared to the silence policy in Soviet after Chernobyl (Rubin, 1987, p. 54). As Rubin points out, “nuclear power is an intensely political issue, so every source is speaking from some viewpoint” (Rubin, 1987, p. 53) and this does not make the situation in which the media have to communicate easy. They are supposed to inform on a potentially life threatening accident, they have experts that either do not speak at all or use technical terms they cannot decode, and on the other sides there are the politicians and economy with their specific interests.

Sharon Friedman (2011) was the first scientist to discuss all three accidents in her article from 2011. In her analysis of the US media coverage of the three largest nuclear accidents (Three Mile Island, Chernobyl and Fukushima), she does not present empirical data, but presents several interesting points. She points to the fact that Fukushima was the first accident to happen in a time where the internet usage was widespread. This enabled other persons than journalists to communicate via blogs, fora and social media and made a huge amount of information available. For traditional journalistic media, the internet also contributed more space and speed to publish (Friedman, 2011, p. 55). Compared to the two previous accidents there was a large amount of information available in 2011. Friedman mentions the example where scientists explained in online tutorials how nuclear plants function and what radiation is. But where there is a lot of information, there is also some false information. The problem that occurred during Fukushima was that information or false information was spread very fast and was impossible to stop or correct (Friedman, 2011, p. 56). This is not only a problem Friedman mentions; in several meetings with affected people, they tell about false information going viral on for example Twitter.

Friedman mentions similarities in media coverage of the three accidents. As she investigated in earlier studies, the technical jargon is hard for lay persons and journalists to understand. This was however less a problem after Fukushima than it had been before (Friedman, 2011, p. 57). *The New York Times* becomes a good grade from the scientist,

because the newspaper mastered the difficult situation and the webpage was used sensible explaining for example radiation (Friedman, 2011, p. 60).

Now turning to empirical studies in which Fukushima is included, the study of **Fretwurst (2014)** should be mentioned as it focuses on two risk dimensions. Fretwurst analyzed secondary data from the previously mentioned study of Weiss et al. (2014), who analyzed two German newspapers and two TV news programs during four months, beginning the 9th of March 2011, after Fukushima. In the newspapers mainly the political desk was analyzed, which would explain the relatively small sample of 871 news features taken together with the broadcast news. With the theoretical approach of news factors, Fretwurst interestingly analyzed the two news factors *detriment* and *risk* and their development over time. Risk was understood as a possible detriment, which has not yet occurred, whereas detriment is the actual consequence of the nuclear reactor accident in Fukushima. Fretwurst divided the media coverage of the accident into three phases based on real world events. Thereby the first phase was the catastrophe phase (11th March 2011 to 27th March 2011), the second one appraisal phase (28th March 2011 to 30th April 2011) and the third phase was the nuclear debate phase (1st May 2011 to 9th July 2011) (Fretwurst, 2014, pp. 109–111). The results show that in all three phases the detriment is focused the most. In the first phase close to 60 percent of the news features cover the detriment, whereas only in ten percent the “risk” is covered. In about 15 percent both detriment and risk are co-occurring. In the second phase detriment is still present in nearly 55 percent but in the last phase, which is the political discussion phase, the detriment is only discussed in 30 percent of all articles. Risk shows the contrary curve and reaches about 25 percent coverage in the last phase of political debate (Fretwurst, 2014, p. 113). Fretwurst concludes based on the strong correlation between detriment and risk that the media coverage of detriment is one, but not the only one, precondition for risk coverage (Fretwurst, 2014, p. 118).

The dissertation of **Perko (2012)** analyze media coverage of two nuclear incidents. The first one was a minor event in Slovenia in 2008, which did not result in any radiological fall out. The media coverage of this event was analyzed during ten days after the incident, in 14 countries. The second one was Fukushima, whose Belgian press media coverage was analyzed during two months. In addition, the study also analyze the public opinion on nuclear energy in Belgium and Slovenia in 2009 and 2011 (Perko, 2012, pp. 31–34). Here only the results of the content analysis will be discussed. The incident in 2008 in Slovenia was rated with a zero on the INES-scale, but was still covered by the media in many countries. During the two weeks of the sample, the Italian newspapers covered the incident the most with 12 articles per newspaper. Thus the Italian press covered the event even more than the media in Slovenia, in which the event occurred (7

articles per mass medium). The least interest was shown in France, Spain and the UK (Perko, 2012, p. 148). Across all countries of the analysis, the focus was mostly on the safety and the risk aspects of the technique (50-75 percent). The technical aspects as well as the international reactions were also often in focus but to different degrees in different countries (Perko, 2012, p. 154). The author conclude that even though this event was only a minor one, in countries like Italy and Germany, where a discussion of nuclear energy was on the public agenda, this event triggered a large level of media coverage (Perko, 2012, p. 156). This result has some similarity to the result of Kepplinger (1988) that show that if a negative stance is already present, a negative event like a nuclear accident will trigger even more attention. In the study of Perko (2012) the incident in Slovenia was covered even more by countries where there was an ongoing public discussion of nuclear energy than in Slovenia itself. Obviously an event similar to an issue already on the agenda will have a lower threshold and be due to a more intense discussion even if the event was not severe and also happened in another country.

The results of the second content analysis of Perko (2012) revealed that the focus of the 260 articles in the two Belgian quality newspapers *Le Soir* and *De Standaard* were in 23 percent the crisis management. The second most prominent focus were the affected inhabitants (15 percent) followed by risk and safety (13 percent). Conflict or disagreement was expressed in between 20 and a bit over 40 percent of the articles during the nine weeks after Fukushima. Interestingly was that even though Fukushima was still close and the 25 anniversary of the Chernobyl accident was remembered in this time period, most articles had a neutral orientation (50-100 percent) towards nuclear energy. The clear positive, negative and balanced articles mostly were around zero to ten percent. However, the study observed a clear negative peak with 40 percent of the articles having a negative stance and this was the week in which the anniversary of Chernobyl took place (Perko, 2012, pp. 132–134). So even if media in different countries tend to be very attentive to in this case nuclear accidents and even cover them if they are not severe, but because they relate to an issue already on the public agenda, they do not present those events as very negatively. The events are obviously not used to put a negative stance on the technique, even if events like Fukushima could be expected to have a much clearer negative bias.

A study conducted by **Schwarz (2014)** analyzing frames in eleven newspapers from the countries Germany, UK, India, Japan, Singapore and the USA during the four months following the Fukushima accident, showed in which contexts risks and benefits of nuclear energy were covered (Schwarz, 2014, p. 167). In a two-step cluster analysis eight frames were found and in three of those risks and benefits were main factors. In the frame called “political-economic outcomes in the own country” risks and benefits of

nuclear energy were covered. Those were co-occurring with political consequences. This was however found in eight percent of all news articles and thereby it was one of the weakest frames. In the frame occurring in twelve percent of all articles and which is called “severe consequences, high risks and high need for action”, risks are co-occurring with political, health and environmental consequences. This was the third strongest frame after the two more neutral frames, one of which emphasized the natural cause of the accident. In the frame called “situative causes of the crisis and nuclear power risks”, which was found in eleven percent of the articles, the risks were emphasized and at the same time it was pointed to the natural causes of the accident and the consequences also in other nuclear power plants not operated by Tepco (Schwarz, 2014, pp. 170–175). The country comparison showed that the political-economic frame was strongest in India and Germany and weakest in the USA and Japan. The severe consequence frame was about equally strong in all countries except Germany. The causes frame was very strong in the USA, quite strong in Singapore and weak in Japan (Schwarz, 2014, p. 175). Overall, a neutral media coverage was often seen in all countries (Schwarz, 2014, 170; 175). Schwarz concludes that it seems that cultural value orientations might have influenced the framing differences in the countries (Schwarz, 2014, p. 178). The frames containing risks and benefits being overall relatively strong show that those aspects were considered in the media coverage of the accident.

The study of **Kristiansen and Bonfadelli (2014)** analyzed three Swiss Sunday newspaper one year after Fukushima (including the first anniversary). We found 423 articles covering Fukushima and nuclear energy, whereas 30 percent of those were published in March 2011. The following two months included 15 percent of all articles (Kristiansen & Bonfadelli, 2014, 306; 308). The most prominent topics over time were nuclear energy and politics, which was mentioned in 39 percent of all articles. This shows that the media coverage the accident triggered was mainly a political debate. If looking to the Figure 6³⁴, the number of articles over time and the political events that are pointed to it becomes obvious that the political debate was a main reason for the peaks in media coverage. The second common topic was the one of renewable energies, as it was mentioned in twelve percent of all articles. Over time this topic looks like a background topic, quite prominent until June 2011, then disappearing but helping causing the peak in September. This was the point in time in which the motion to phase-out nuclear energy was accepted by both councils. The renewables point to a discussion about how to supply energy in the future. Two topics were on place three and both mentioned in nine percent each in all articles. Those were the nuclear accident in Fukushima as well as

³⁴ Some of the data analysis made here are new and have not published in Kristiansen and Bonfadelli (2014).

energy efficiency, supply and prices (not shown in Figure 6). Obviously the nuclear accident disappeared fast, which again points to the debate being a mainly political one (Kristiansen & Bonfadelli, 2014, p. 310).

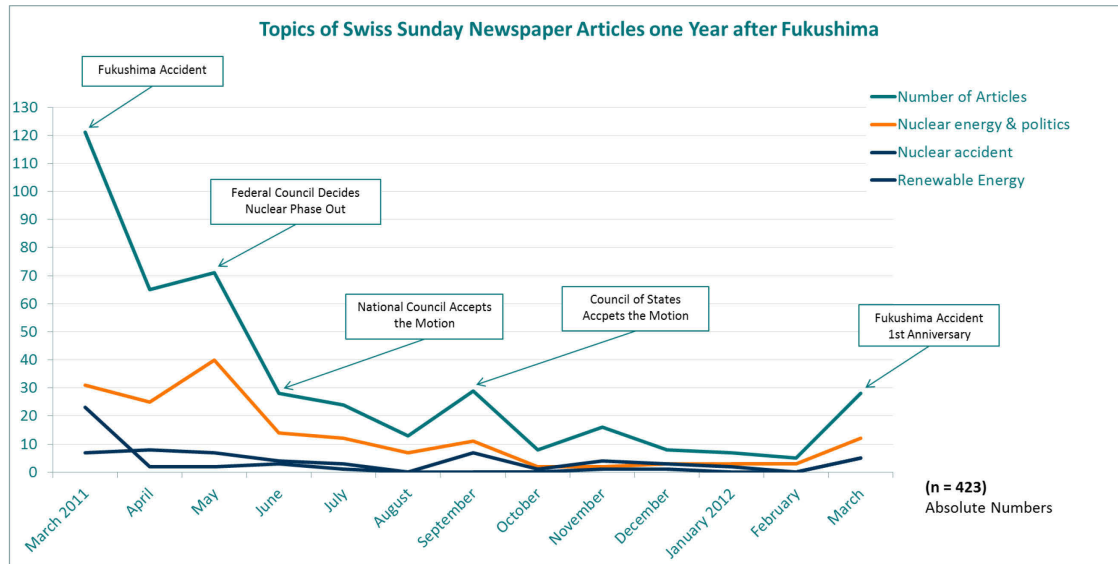


Figure 6 Number of Swiss Sunday Newspaper Articles and Their Most Prominent Topics One Year after Fukushima

The study also analyzes how often benefits and detriments (actual or potential) were mentioned. Detriments were mentioned in 49 percent of the articles and the benefit in 29 percent. Not many articles had a clear bias in favor or against nuclear energy. But statements against nuclear energy were present in 20 percent of all articles and in favor were only three percent. The study also analyzed up to three actors per article and the most common ones were Swiss politicians, they spoke in 62 percent of all articles. Scientists and experts were also often present, with 56 percent and economical actors and nuclear operators were the next big actor group with 37 percent (Kristiansen & Bonfadelli, 2014, pp. 311–312).

Another frame analysis is the one of **Nienierza (2014b)**, who compared the framing of Chernobyl and Fukushima in two German dailies and one weekly news magazine six weeks after the two accidents (28th April to 8th June 1986 and 11th March to 22nd April 2011). After sampling according to a rolling week the author ended up with a sample of 240 articles. The cluster analysis resulted in four frames after each accident. Interestingly the most common frame after Chernobyl was the economic benefit frame, which occurred in 34 percent of the articles. The second most common frame was the phase-out frame which occurred in 31 percent of the articles. This frame did not discuss any detriment or benefits dimensions of nuclear energy (Nienierza, 2014b, 37-38; 42-43; 45). Immediately after the accident, the frame “risk” and “economic benefit” were the most

common ones. The phase-out frame developed some weeks after the accident. The most common frame after Fukushima was the one of nuclear energy as a transition technique. This was a negative frame which was seen in 31 percent of the articles. The second most common was the government frame in 25 percent of the articles, which only showed the perspective of the government (Nienierza, 2014b, pp. 46–47). Nienierza concludes that there were similar frame patterns after both accidents. The frames of risk, the economic benefit as well as the nuclear phase-out were all identified after both accidents. After Chernobyl the favoring camp was arguing to keep nuclear energy production, whereas they in 2011 “only” spoke about prolonging the run-time of the plants. After both accidents the majority of articles had a negative stance against nuclear energy (Nienierza, 2014b, pp. 49–50).

6.4. Interim Conclusion of Nuclear Accident Coverage Studies

This section will sum up the findings previous media coverage studies regarding nuclear energy have found out. For an overview some of the most important results of the here reviewed studies have been compiled in Table 4, in which they are divided according to geographical region and analyse aspects.

Table 4 Research overview summary

	CH	USA	DE	Other countries
Risk coverage	Detriments were mentioned more than benefits after Fukushima ¹⁸	Not enough risk information provided for evaluating risk ⁶	-Detriments are focused upon more than benefits or “risk” ^{9, 17} -Risk and safety are mentioned more after accidents than before ¹⁶ -Energy supply and environmental sustainability mentioned more before Fukushima ¹⁶	UK: Official nuclear energy debates are reproduced ¹³
Topics	Nuclear policy is the most covered topic ^{5, 18}		Radiation levels is a commonly covered topic ^{8, 9}	-Safety and risk issues are most common topics across different countries ¹⁵ -Radiation levels was commonly covered in Italy after Chernobyl ¹²

	CH	USA	DE	Other countries
Actors	-Politicians are the most cited actors ¹⁸ -Sunday press cover scientists and experts as the second largest actor group ¹⁸		Mainly political actors ^{8, 9, 16}	
Bias	Rather neutral coverage after Fukushima ¹⁸	-Positive bias in the early days of the technology ² -Increasingly negative media coverage, induced by nuclear accidents ^{4, 10} -Balanced coverage after Chernobyl ¹¹	-Negative bias already before nuclear accident, and amplified by accident ⁹ -Positive bias mainly comes from political actors ¹ -Overall neutral coverage in different countries, including Germany, after Fukushima ²⁰	UK: Opposing media coverage is decreasing over time ¹³
Amount of media attention	-In general increasing amount of coverage ⁵ -Nuclear events trigger attention ⁵ Most media coverage of nuclear energy occur after accidents ¹⁸	-Strong media focus of the issue in the 50ties ² -Nuclear events trigger media attention ¹⁰	Nuclear energy protests get more media attention than some nuclear incidents ¹	Minor nuclear energy incidents trigger more coverage in already negatively biased countries (e.g. Germany) and less in more positive countries (e.g. France) ¹⁵
Framing		More reassuring than alarming coverage of TMI accident ³	-The domestic outcomes regarding political-economic issues is the frame in which risks and benefits are considered the most ²⁰ -Economic benefit frame was the most common one after Chernobyl ¹⁹ -After Fukushima the most common frame was nuclear energy as a transition technology ¹⁹	IT: Health threat frame was most prominent after Chernobyl ¹²

CH	USA	DE	Other countries
Other aspects	-Difficult issue to cover for journalists, especially in the early days of the technology ³ -During accidents information flow can be difficult ⁷ - Internet can help information flow during accidents, but also spread false information ¹⁴	Rather reassuring coverage after Chernobyl ⁸	
Sources: ¹ Burien 1980, ² Mazur 1981, ³ Friedman 1981, ⁴ Stephens & Edison 1982, ⁵ Saxer et al. 1986, ⁶ Friedman et al. 1987, ⁷ Rubin 1987, ⁸ Teichert 1987, ⁹ Kepplinger 1988, ¹⁰ Gamson & Modigliani 1989, ¹¹ Friedman et al. 1992, ¹² Cantone et al. 2007, ¹³ Doyle 2011, ¹⁴ Friedman 2011, ¹⁵ Perko 2012, ¹⁶ Arlt & Wolling 2014, ¹⁷ Fretwurst 2014, ¹⁸ Kristiansen & Bonfadelli 2014, ¹⁹ Nienierza 2014, ²⁰ Schwarz 2014			

To sum up the results of the studies analyzing accident coverage, regarding the media coverage of Three Mile Island, studies claim that the US media coverage was balanced, mainly positive and reassuring but critical to the communication situation. This was a new situation to all involved and the experts did on the one hand not provide enough information and on the other hand they communicated in a language journalists could not easily understand. This has been critically evaluated by several researchers (Friedman, 1981; Rubin, 1987; Rubin & Cunningham, 1979; Stephens & Edison, 1982). The content that was covered was mostly on the health and safety issue rather than the general one of nuclear energy. The controversy of nuclear energy was present as the future of nuclear energy was questioned, but also the necessity was discussed (Stephens & Edison, 1982). This accords with what Gamson and Modigliani (1989) found out, that the accident on Three Mile Island did not immediately trigger a clear anti-nuclear energy climate, but it did make way in that direction, by adding an opposing flavour. Mazur's (1981) result that the public opinion in the US was negatively influenced by the accident, but recovered to the previous state within two months after the accident also confirms that Three Mile Island did not trigger a fundamental change in the US. In Germany however according to Kepplinger (1988) the media coverage was already negative to nuclear energy as the accident on Three Mile Island occurred. He mentions a turning point in 1974 in the German media coverage, after which point the tendency on nuclear energy never recovered to the positive side again (Kepplinger, 1988, pp. 664–665), which considering Buiren's (1980) results might have been due to nuclear protests in Germany at that time. Therefore, the media coverage of Three Mile Island was already quite negative in Germany.

After the accident in Chernobyl, there was again an information problem. This time it was mainly caused by the USSR that did not give out any information at first. This produced a chaotic situation in which Sweden measured higher levels of radiation, but no one knew what had happened before a few days after the accident. In the German, Italian and the US coverage radiation levels were a common topic (Cantone et al., 2007; Friedman et al., 1992; Teichert, 1987). Again, the complexity of the technique and radiation levels were a hurdle for journalists to overcome, but according to Friedman et al. (1987), the information was appropriate but too sparse to enable people to evaluate the risk. Prominent topics were the accident itself, safety, nuclear phase-out, the health threat the radiation caused (Cantone et al., 2007; Friedman et al., 1992; Teichert, 1987). The detriment was focused more upon than the benefit (Kepplinger, 1988). However contradicting this “accident coverage” is the German frame analysis of (Nienierza, 2014a) who also did find a risk and phase-out frame, but the most common frame was economic benefit frame. Whatever this differing result might be due to, the possibility shall be kept open that there was a moment in media coverage which at the same time as discussing the detriment of the accident and a future phase-out, was also aware of the benefit and why nuclear energy is used.

Regarding actors, several studies have shown that political actors were the main actors in the discourse (Kepplinger, 1988; Teichert, 1987; Westerståhl & Johansson, 1991). The notion of the nuclear energy debate of being a political one is also to be seen in the accident coverage following Fukushima (Arlt & Wolling, 2014; Kristiansen & Bonfadelli, 2014; Weiß et al., 2014). The detriment of the accident, the risk and safety topics were the most prominent topics after the accident (Arlt & Wolling, 2014; Fretwurst, 2014; Kristiansen & Bonfadelli, 2014).

The research already conducted delivers many interesting aspects on how media coverage of nuclear accidents takes form. What this research overview however also makes clear is that most studies analyze a few weeks up to a few months after the accidents. Our study (Kristiansen & Bonfadelli, 2014) does however cover a year after Fukushima but does not collect any data to the situation before the accident. Therefore, the lack of longer term studies is considered a research gap. Regarding risk coverage, the time span of studies is considered to be an important aspect to take into consideration. Risk coverage around accidents, and risk coverage at times where there is no detriment drawing attention to it, are most probably quite different.

Additionally, none of the reviewed, or other known studies go into detail on how the *risk*, in the broader sense applied in this study, of nuclear energy is covered by the media. As this study argues not only the moment of detriment is important to understand risk communication, risk perception and risk decisions, it aims to close both those

research gaps and analyze risk coverage over a longer time. Other than that there has not been many studies conducted in the Swiss context. Because the history and context of nuclear energy is another in every country, and since risks are taken by decisions, and Switzerland being a direct democracy, it is certainly an interesting country to study regarding risk coverage.

As the next chapter will introduce the research questions and hypotheses, which this study will investigate, how this study plan to close those research gaps will become clearer. Combining a broad risk understanding with a long-term media coverage study, not only analysing accident coverage, this study will suggest a Risk Attention Phase Model, which will be presented and described in detail in the following chapter.

7. Research Questions & Hypotheses

The aim of this study is to analyze risk communication in a comprehensive manner, studying the media coverage of risk dimensions. To pursue this study, nuclear energy is used as an example of an energy solution with a complex risk profile. The first research question asks:

1. How do Swiss newspapers cover nuclear energy?

This first research question will illuminate how Swiss newspapers cover nuclear energy, because very few studies have been conducted exploring how Swiss media deal with the issue of nuclear energy in more recent times and over a longer time period. Hence, the first research question will attempt to close this research gap and answer other related questions like how much media attention the issue gets in routine phases compared to when accidents occur, which topics define the media coverage, which actors speak in the coverage, and whether the coverage is biased, controversial, and sensationalistic. This research question will add new knowledge to the studies, which have studied Swiss media coverage of nuclear energy risk in previous years, thereby filling the research gap. In addition, the research will add new knowledge to how Swiss newspapers deal with the issue in routine phases, in which no detriment is triggering attention to nuclear energy. Drawing on the results of previous studies (Gamson & Modigliani, 1989; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986), the amount of media coverage given to nuclear energy is assumed to be higher when an accident occurs.

H1: The media attention given to nuclear energy is clearly higher when a nuclear energy accident occurs.

Regarding the topics and actors in the coverage, previous studies (Arlt & Wolling, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986; Teichert, 1987) show that nuclear energy is mostly presented in a political context; this is assumed to hold true in this case as well.

H2: The nuclear energy issue is mainly presented in a political context with topics and actors being strongly related to policy.

As previous studies have shown, the bias of the nuclear energy coverage differs across time and countries (Kepplinger, 1988; Kristiansen & Bonfadelli, 2014; Stephens & Edison, 1982). Therefore, it is assumed that:

H3: The media coverage of nuclear energy is rather positive before Fukushima and then shifts to a strong negative bias which gets weaker the more time passes after the accident.

A broad risk understanding has been derived based on the risk definitions discussed in chapter 4. Risk is not only the negative detriment it can cause or the benefit it may bring. Risk also includes a *decision*, which comprehends a more or less conscious weighing of potential *benefits* and *detriments* against each other, in a more or less *uncertain* situation depending on the amount of information available on *probabilities*, *degrees*, and *severities* for both the benefits and the detriments. How media cover this complex construct will be studied here by analyzing how media depict these risk dimensions. Much is known about how media cover accidents, but since not as much is known about how media cover risk as a whole, this study aims to deepen and broaden this understanding. This, on the other hand, is not only interesting for communication science, but also for society at large. Since modern society presents many risks, not all of which are directly obvious, it is important that the mass media acts as an important information source on risks, in all of its aspects. This might not automatically mean better informed citizens, but at least the information is provided and could potentially lead to citizens' awareness of several risk aspects.

The risk of nuclear energy enables studying risk coverage, since the risk includes all six risk dimensions: decision, benefits, detriments, probability, degrees/severity and uncertainty. The information on these risk dimensions theoretically could potentially enable citizens to make informed decisions concerning the usage of the technology. The second research question goes into detail about the depiction of risk by analyzing the risk dimensions and asking:

2. How do media cover risk?

Climate change and the need to transition away from reliance on fossil fuel-based energy sources increase the demand for energy, which could be solved by nuclear energy plants. Nuclear energy production has clear benefits, but because of the fears connected to the technology, especially after accidents like Fukushima, nuclear energy production remains a highly contested issue. This combination of factors makes the nuclear energy debate a good topic for studying media risk coverage. While societies search for environmentally friendly ways of producing energy and discuss the risks of different technologies, key events like that in Fukushima have fundamentally reignited the

discussion, enabling the analysis of how coverage changes before and after a disaster of this magnitude.

Since nuclear energy is a recurring issue of debate in Switzerland, it is well suited for this kind of analysis. Switzerland has a long-standing history of debating this topic and several political decisions have led to referendums based on this risk. This debate and many of the corresponding decisions have been covered by the media, thus the media coverage of this issue offers a perfect opportunity to analyze how the media and the direct democracy of Switzerland deal with a complex risk issue like this before and after a disaster (detriment) and how this key event might influence the coverage. Based on the results of previous studies, often with a two dimensional risk understanding, it is assumed that the detrimental side of nuclear energy is in stronger focus than the beneficial side of the technology (Arlt & Wolling, 2014; Fretwurst, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014).

H4: In general, media focus on the detrimental side of nuclear energy more than the beneficial side of the technology.

Other risks with a higher probability of causing detriment, such as driving or smoking, are rarely depicted by the media as having such high probability to be detrimental as the risk of nuclear energy. Individual detriment caused by those risks does not generally transform these risks into key topics of media coverage. Climate change is another risk that also generates a lot of media attention (Nisbet & Myers, 2007; Schäfer, Ivanova, & Schmidt, 2012; Schmidt et al., 2013). Even if the detriment from climate change might already be happening, it is a much more complex risk because this detriment is not as easily visible as that caused by a nuclear accident, where a nuclear power plant explodes and forces people to evacuate their homes. The risk of nuclear energy offers a window into the media depiction of this risk, which might also provide a sort of progression stretching from a positive opinion about climate, over a detriment, political reconsideration, and decision-making process.

Not all risk detriments trigger such a fundamental and immediate re-thinking of the risk decision. It is interesting to see how this threatening detriment, which can be very severe but highly unlikely, is discussed in light of the benefits of the clean, inexpensive, and reliable energy production that nuclear energy offers. How did the Fukushima disaster change the debate and its coverage? How do societies deal with this dilemma? And how do media deal with this complex situation? The third research question employs the theoretical approach of key events and focuses on the before and after perspective:

3. How is media attention and coverage of nuclear energy different before and after a key event like Fukushima?

Since most studies concentrate either on the *hot* phase of media coverage after a detriment occurred or analyze coverage in the *cold* or *warmup* phases, but do not analyze the depiction of risk in such detail as this study does, little is known about the details of risk communication without disasters bringing attention to such risks. Deeper and more detailed knowledge about risk communication is, as this study argues, inevitable to extending the knowledge about how media deal with risks and what effect this might have on the risk perception, technological acceptance, and the risk decisions of people and society.

Now that climate change and CO₂ emissions are putting pressure on governments and corporations to produce clean energy, an event like the Fukushima meltdown reminds us of the potential detriment of nuclear energy production. This is a critical moment for analyzing how the risk dimensions of nuclear energy might be depicted over time and might form a phase pattern that goes beyond before and after. Building upon both the risk definition and phase models of Downs (1972) and Eisner et al. (2003), as well as what is known about how key events influence media coverage, this study asks a fourth question:

4. Does media depiction of risk form a phase pattern?

This fourth research question suggests a Risk Attention Phase (RAP) Model, and this study will provide general and more specific knowledge that will enable the empirical analysis and underpinning of the tentative RAP model.

Hypotheses derived from the four research questions will be used to investigate the tentative RAP model; these hypotheses are presented in the following sections. Based on the analysis of the nuclear energy coverage in general, the comparison of coverage before and after the key event in particular, and the detailed analysis of risk coverage enabled by the broad risk definition, five phases are proposed.

Based on the idea that risk involves making a **decision** to secure a **benefit**, which has a certain degree to which it is beneficial, a certain probability of occurring and is more or less uncertain, while accepting the **possibility** of future **detriment** whose **probability**

of occurrence and **severity** is **predictable** to a greater or lesser degree,³⁵ this study aims to capture the *anatomy* (Rowe, 1975) of risk communication, which is hypothesized to be structured by those dimensions. The notion of risk dimensions includes the advantage of enabling a detailed analysis of risk coverage combined with other general aspects of media coverage. The phase model will also account for other relevant political, social, or economic events. Learning from key event studies, the phases will also be defined by analyzing actors, arguments, political bias, and topics to put risk in a context and understand how it is embedded over time. As this research will be explorative, the suggested phases and their names are only tentative suggestions, which will have to be empirically proven and might change, as section 9.6 will show. Beyond having implications for the field of risk communication and especially future risk coverage studies, a RAP model also suggests interesting indications for the praxis. Questions on whether a specific risk phase makes a difference for risk decisions become relevant to investigate. What would a risk attention phase model suggest for risk policy and risk assessments? Are decisions and assessments possibly different if undertaken in different phases in which the mass media focus on different risk dimensions? This study will not contribute to answering those questions, but it will possibly contribute a risk attention phase model, which will enable the identification and definition of different risk phases, which might well have further reaching societal implications.

7.1. Risk Attention Phase Model

This section proposes a tentative phase model that will be tested in this study. The model relies on knowledge from previous studies and also bears new hypotheses that this study urges to answer, some of which are connected to (political) nuclear events from that particular period. This chapter is divided into sections that describe each phase and detail the features each phase is hypothesized to take on. For a better overview, the characteristics that are expected to define the different phases are compiled in Table 5.

³⁵ The definition relies on the German version of it published by Kristiansen and Bonfadelli (2014) (see also footnote 13).

Table 5 Hypothesized Characteristics of the Risk Phases

Phase	Risk Dimensions	Topics	Actors	General Media Presentation	Amount of Media Coverage
Prospective optimism	- Benefit - Decision	- Economy - Policy	- Political - Nuclear operators	- Positive bias - Uncontro- versal	Sparse
„Media Storm“¹	- Detriment - Severity - Uncertainty	- Accident	- Experts - Scientists - Nuclear operators	Neutral	- 150 % atten- tion increase - 20 % of me- dia coverage - lasting for one week
Window of opportunity²	- Decision - Detriment - Benefit - Probability - Severity - Uncertainty	- Policy - Nuclear phase-out	- Political - NGOs	- Pro & contra - Biased newspapers	Mid to high
Reconsideration	- Decision - Detriment - Benefit on upswing	- Policy - Similar events & issues like climate change	- Political - Nuclear operators	Neutral	- Sparse - Minor peaks
Slumber	Decision	- Policy - Similar events	- Political - Nuclear operators	Neutral	- Very sparse, or lower than before Fuku- shima

Note: ¹Boysdstun et al. (2014); ²Elmelund-Præstekær & Wien (2008)

7.2. Phase One: Prospective Optimism

Before the disaster at Fukushima as described in the introduction (see chapter 1) there was, if not yet a “nuclear renaissance” (Marshall, 2005), at least a positive opinion climate. Roten referred to this as a “nuclear revival” (2013, p. 109). In Switzerland, nuclear energy seemed to have a future. Therefore regarding risk communication, this is a phase in which the *benefit* is expected to be focused upon by the mass media. Moreover, as there are political decisions to be made and referenda to be held, this may also be a point in time where the *decision* triggers attention. For example, having three nuclear operators prepared to build new plants may be the impetus for a city or region to decide whether nuclear energy is beneficial enough to be used in the future. It does not seem probable that opposing voices are in focus in this phase. This is not to say that they have abandoned their agendas, but rather that the opponents of nuclear energy are not very

prominent in the media coverage. According to this argument, two hypotheses can be formulated:

H5: Before the Fukushima disaster, the risk dimensions of benefit and decision were the focus of media attention to a higher degree than after the accident.

The most likely topics of focus in this phase are economic and policy topics, which would be conform to benefits and decision being in focus. For the same reason, political actors and nuclear operators might be the most cited or mentioned actors in this planning phase. In light of the positive referendum in Bern in February 2011, the opinion climate was rather in favor of nuclear energy, therefore it would be expected that the media coverage was rather positively slanted. If the climate is mainly positive and the benefits are in focus, then it could be hypothesized that there will be little controversy in the media coverage and fewer reasons to draw attention to the issue in general. This conforms with previously discussed studies (e.g. Kepplinger, 1988); when nothing negative happens in nuclear energy plants, the issue of nuclear energy does not get much media attention. Those general media coverage characteristics are formulated in hypothesis six, with sub hypotheses:

H6: Before Fukushima, nuclear energy is expected to trigger sparse media attention, which focuses on:

- economic and policy topics,
- politicians and nuclear operators, and
- a rather positive and uncontroversial tone.

7.3. Phase Two: “Media Storm”³⁶

As the Fukushima disaster was an unexpected event, the media coverage of nuclear energy is expected to change from one day to the next. A shift in focus is anticipated away from the benefit and decision to the detriment, its severity, and the uncertainty because of the initially sparse information available.

H7: Fukushima will trigger a focus shift to the risk dimension detriment, its severity, and uncertainty.

³⁶ Boydston et al. (2014)

This will be an important phase for risk communication, without which it is uncertain whether the detriment dimension will ever be the subject of such strong focus. In risk situations, and in the special case of nuclear energy, knowledge or fear of the possible detriment may be constantly present, but as others have noted, “the nuclear world features periods of both extreme fear and attention, and apathy and nuclear forgetting” (Boyer, 1984; Ungar, 1992, p. 486). Since media tend to be event oriented, they might have no reason to cover the potential detriments during phases where nothing happens. Therefore, this phase seems to be highly important for understanding risk. This phase will likely focus on the particulars of the accident, the directly affected country, and the people. As this might be a phase of intense information providing, and since assessments of the situation will be needed, actors like experts and scientists, as well as the affected nuclear operator are expected to be actors focused upon. While these actors are in focus, there might not be as many negatively slanted statements, since these actors are expected to make rather fact based and neutral statements.

H8: Fukushima will trigger media attention on:

- the accident itself,
- statements from experts, scientists and nuclear operators, and
- the overall tone will be rather neutral.

After a major disaster like this, there will be no *warm-up* phase in which media attention slowly increases as some phase models describe (Downs, 1972), but rather a sudden explosion of media attention on the day of the key event. It seems probable that this phase can be defined as a media storm, as defined by Boydston et al. (2014). In order to test this, the current study relies on the operationalization of media storm that Boydston et al. (2014) suggested.

H9: This phase will include:

- a 150 percent increase in media attention to nuclear energy, where
 - 20 percent of all news stories will deal with the nuclear issue,
 - for at least one week.

7.4. Phase Three: Window of Opportunity³⁷

The third phase is expected to overtake the second phase as soon as the focus shifts from the detriment to the decision dimension, because the accident is expected to trigger a political discussion. This may also be the moment where media attention to all risk dimensions is given. The *detriment* is in fresh memory, but the *benefits* have not been forgotten, so there might be arguments pointing to the *probability* of detriment, arguments that point to the potentially large *severity*, and others arguing that the prediction is *uncertain*.

H10: In the phase of political deliberation, all risk dimensions will be discussed, but the decision will be the clear focus.

After the accident coverage has receded and the accident itself is not news anymore, political topics are assumed to climb the agenda and the nuclear phase-out topic too. With the new hand of cards that Fukushima dealt and the window of opportunity it opened, the phase of political deliberation is expected to be a phase when several different actors in the field will be eager to get involved. Political actors will be more or less expected to make statements on how they plan to proceed in the new situation. Non-Governmental Organizations (NGOs) and other interest groups will have a window of opportunity (Elmelund-Præstekær & Wien, 2008) to be identified in media coverage. Therefore, this will probably be a phase in which some positive statements will be observed amid many more negative statements. In addition, this phase might be a time when different political biases between news outlets becomes more apparent (see *instrumental actualisation* of Kepplinger 1988). Compared to the phase immediately following the accident, this phase is predicted to generate a lower level of media attention, although probably not as low as before the accident.

H11: The window of opportunity is assumed to be further defined by:

- political topics and a nuclear phase-out,
- media attention on political actors and NGOs,
- a mostly negative bias,
- differences between media outlets regarding general bias, and
- declining media attention, albeit still more intense than before Fukushima.

³⁷ Elmelund-Præstekær and Wien (2008)

The length of this phase is difficult to predict. Graf (2003) argued that attention declines as soon as a political decision has been made. This provides several possibilities for this phase to end. Already three days after Fukushima, Doris Leuthard (the Swiss Energy Minister) cancelled the licenses for the three planned nuclear power plants. As soon as May 25, 2011, just two and a half months after the Fukushima disaster, the Swiss Federal Council decided on a nuclear phase-out. However, this decision had to be approved by the National Council (June 2011) and the State Council (September 2011). However, the format of the Swiss political system implies that this might not be the final decision. A referendum might be expected on this question. As late as the autumn of 2015, the Swiss citizens had not yet been asked their opinion on a national nuclear phase-out. Because of the high general involvement in nuclear energy issues in Switzerland, it is still probable that there will be a referendum on this topic. Whether this third risk communication phase will last until a referendum occurs is unclear. Media risk coverage is expected to generate additional phases. These phases, however, seem the most difficult to predict.

7.5. Phase Four: Reconsideration

Phases four and five are subject to the most speculation since there is sparse knowledge of what happens to a risk issue long after detriment has occurred. I choose to call it “reconsideration”, because I hypothesize that the key event Fukushima briefly triggered a rather black and white situation, with a negative stance. Since nuclear energy is still very much needed, it is not possible to immediately shut down all nuclear power plants. This leaves time for reflection and reconsideration, which is what is predicted to happen in this phase. As the accident becomes increasingly distant and the authorities in Japan gain control over the situation, the events of this phase will eventually provide room for differentiated deliberation. Therefore it is expected that the risk focus of this phase will narrow, returning again to decision and detriment. A new decision might still need to be taken and the detriment will still be in fresh memory. Simultaneously, the benefit might be on an upswing.

H12: As the risk of nuclear energy is reconsidered, decision and detriment might return as the main focus, and benefit might experience an upswing.

As long as a decision is still pending, policy topics will likely remain in focus. According to research on key and triggering events, this might be the phase in which similar events get attention. The threshold for attention to the nuclear issue generally might have been lowered and, in this phase of reorientation, journalists and citizens look for clues to help them deal with the situation and make up their minds on the issue.

Therefore, this may be a phase where events get attention that might otherwise not have generated much media attention. These events might also be presented in a way that make them seem more similar to the key event than they might actually be (Brosius & Eps, 1995; Esser, 2011; Fishman, 1978; Kepplinger & Habermeier, 1995; Rauchenzauner, 2008; Vasterman, 2005; Wien & Elmelund-Præstekær, 2009).

If decisions made shortly upon Fukushima are being reconsidered, political actors are expected to be the focus of media attention, while nuclear operators might also have their say. The immediate “battle” that might have defined the preceding phase is over, causing no clear bias, but rather neutral media coverage. The attention is expected to be quite sparse, with similar and subsequent events causing minor peaks of media attention.

H13: The reconsideration phase is expected to focus on:

- policy topics and similar events;
- political actors and nuclear operators; and
- the sparse coverage will be rather neutral.

7.6. Phase Five: Slumber

The theory predicts that the nuclear energy issue will eventually be object of fatigue (Luhmann, 1971; Waldherr, 2014) and that the corresponding media attention will slide into a slumber, where it will stay until the next event (of any type) reawakens it and triggers an attention peak or starts the RAP model over again. This phase model is consciously not called a “cycle”, like the issue attention cycle documented by Downs (1972), because it implies that the cycle will repeat forever. However, it is possible that issues die and never gain attention again. For risks that we decide not to take again, there is no reason to expect a risk attention *cycle*.

Like phase four, this fifth phase is based on some speculation and the hypotheses are not written in stone. It might also be true that this phase cannot be empirically demonstrated in this study, depending on if and when it begins. The decision risk dimension is expected to remain in focus as long as no final decision has been made about how to handle the situation. None of the other risk dimensions are expected to remain in focus. It might be a long time before the benefits garner as much attention as before the Fukushima disaster, but this depends on the context. If the climate change issue receives a strong upswing in media attention, or other energy related events change the opinion climate, it is possible for nuclear energy to regain its positive stance.

H14: Until a final decision is taken on the nuclear risk, decision will be the risk dimension that attracts the most media focus.

If this unresolved issue remains on the political agenda, policy topics and possibly similar events will be the main topics of media coverage. In that case, politicians and nuclear operators will be the primary actors speaking, as they will still pursue certain interests and might be grateful to have their voices heard, hoping for another chance as the situation has calmed down. The tone of this coverage is expected to be more or less neutral and the amount of attention will likely return to a level similar to or lower than before the accident.

It is expected that the issue slowly enters into a phase of low attention. Until a political decision is made, the issue might still be discussed broadly, including all the risk dimensions and perhaps a slight bias in the direction of the impending decision and a focus on political actors.

H15: This predicted phase of very low media attention:

- will focus on policy and potentially similar events;
- including political actors and nuclear operators; and
- will be characterized by neutral media coverage.

8. Method

Given the research questions, this study will use a quantitative content analysis as its method. With this analysis method, it will be possible to investigate how the media depicts risk, in particular the risk of nuclear energy. With nuclear energy being a rather political issue, the media outlets that engage in this political debate are best analyzed. Furthermore, quality newspapers are well-suited to investigate these questions since they engage intensively in this sort of debate. At the same time, those newspapers set the agenda of other media outlets, which is one reason why this study will only analyze newspapers. Another reason for only focusing on newspapers is, of course, an economical one in terms of research. Collecting newspaper articles over six years is comparably easy compared to collecting broadcast media news over the same time span.

8.1. Topic of investigation

The topic of investigation is nuclear energy. Nuclear energy is a risk with clear benefits, observable, potentially severe, but low probability detriments, and it is a politically contested technology. Therefore, an analysis of media's depiction of this risk serves the aim of this study perfectly. It not only enables socially and politically relevant gains in knowledge of how this political debate progressed before and after Fukushima, but it also enables the analysis of risk coverage more generally. And with Fukushima as a key, unexpected event, the political risk arguments take a sudden turn, which enables a focus on changes that happen over time in both the general nuclear energy debate and in the media's depiction of risk, more specifically. As described in Chapter 3, Switzerland has an energy-focused political context that is very well suited in aim for seeing changes over time. It is a direct democracy, which makes the mass media's depiction of risk essential in the public's risk decisions. Additionally, since its nuclear context before Fukushima was rather positive, with building plans, and then dramatically changed after Fukushima, with phase-out plans, the country is within a context and point in time that is perfect for the aims of this study.

To capture this debate, a catalogue of specific key words was developed. During this development process, newspapers were scanned for articles that were relevant to the debate, and important key words were collected to enable a sampling that would capture

all relevant news articles. The final key word catalogue includes the following, translated from German to English³⁸:

Nuclear energy; nuclear power; nuclear electricity; nuclear power plant; new nuclear power plants; general license application (for new nuclear power plants); energy policy; nuclear energy policy; alternative energy; renewable energy; energy strategy; Chernobyl; Harrisburg; Three Mile Island; and Fukushima.

The news articles (see next chapter (8.2) for media of investigation) were collected from the databank *Factiva*. *Factiva* is owned by Dow Jones and collects full text articles from several thousand newspapers from many different countries. The databank's search engine allows the usage of several relevant keywords. It also has certain advantages, specifically that a sampling going back in time is easy to accomplish and that the articles are electronically available for distribution amongst the coders. Additionally, an estimation of the size of the articles was easy to analyze since *Factiva* specifies this at the start of each article.

With the keywords that were used to sample the newspaper articles a broad debate of nuclear energy, but also a broad energy debate in general, was captured. The search was performed like this to be sure not to miss out on any relevant articles. Articles deemed irrelevant to the study were excluded in the next sampling step.

8.2. Media of investigation

Switzerland is the country of focus in this study and only Swiss newspapers shall be analyzed. As described in Chapter 3, Switzerland has two main reasons for being an interesting country to investigate for the questions of the study. First, it has nuclear energy plants and even had plans to build new ones before Fukushima happened. After the accident, these plans and the general nuclear debate underwent dramatic changes. Second, Switzerland is a direct democracy, which implies that Swiss citizens might have the last word in decisions on nuclear energy usage. Swiss citizens' main source of information regarding nuclear energy is newspapers (Kristiansen & Bonfadelli, 2013) and therefore it was a natural source to choose for this analysis. In a co-authored study Kristiansen and Bonfadelli (2014) were able to show that Swiss citizens self-report high

³⁸ The sampling of news articles was carried out in German. Additionally, for some keywords, their commonly used abbreviations were used. For example, the German word for nuclear power plant is *Atomkraftwerk* or *Kernkraftwerk*, and their abbreviations are AKW and KKW.

media influence on their opinion regarding nuclear energy. Therefore, supposing that Swiss citizens are influenced by mass media coverage of the nuclear debate, the Fukushima accident itself and, of course, also the media coverage of the accident and the nuclear risk in general, media coverage is an important source to consider when wanting to understand not only how the media deals with this issue but also how Swiss society in general deals with these questions.

Two broadsheet newspapers, *Neue Zürcher Zeitung* (NZZ) and *Tages-Anzeiger* (TA), have been chosen for this analysis because they are leading quality newspapers in Switzerland and therefore important inter-media agenda setters with broad news coverage in the German speaking part of Switzerland³⁹. In addition, previous studies have shown that these two particular news outlets are very engaged in the coverage of the nuclear energy issue. The tabloid *Blick*, for example, does not come close to the number of articles on nuclear energy that TA and NZZ publish (Kristiansen & Bonfadelli, 2014). Therefore, they provide an arena in which nuclear energy and its risk coverage can be investigated. Both newspapers are privately owned and published in Zürich, the largest city in Switzerland. They are both owned by large national media companies; TA is owned by the media company called *Tamedia AG*, and NZZ is part of the media company called *NZZ-Mediengruppe*. At the same time, TA and NZZ are national newspapers and among the largest of the paid newspapers in Switzerland. NZZ has a reach of 124,043 readers, and TA reaches 172,920 readers (WEMF, 2015). In addition, they cover a wide political spectrum since NZZ is on the mid-right wing (conservative) and TA is on the mid-left wing (Müller, 2014; Vontobel, 2005). Foremost, however, they do engage in the nuclear debate in Switzerland⁴⁰ and this fact makes them appropriate sources for answering the research questions of this study. The newspapers are both included in the *Factiva* databank, NZZ since 1993 and TA since 1999.

8.3. Time period of investigation

Since this study is interested in changes over time and aims to investigate if there are phases to media risk coverage, a time range of five years and three months has been chosen – starting January 1, 2010 and ending March 31, 2015.

³⁹ Restricting the content analysis to only German language newspapers was economical in terms of research.

⁴⁰ The tabloid *Blick* is often included in Swiss content analyses. Several pilot studies leading up to this study have shown that *Blick* does not engage enough in the political debate to constitute a significant voice. With its considerably lower amount of media coverage, it is being excluded from this analysis.

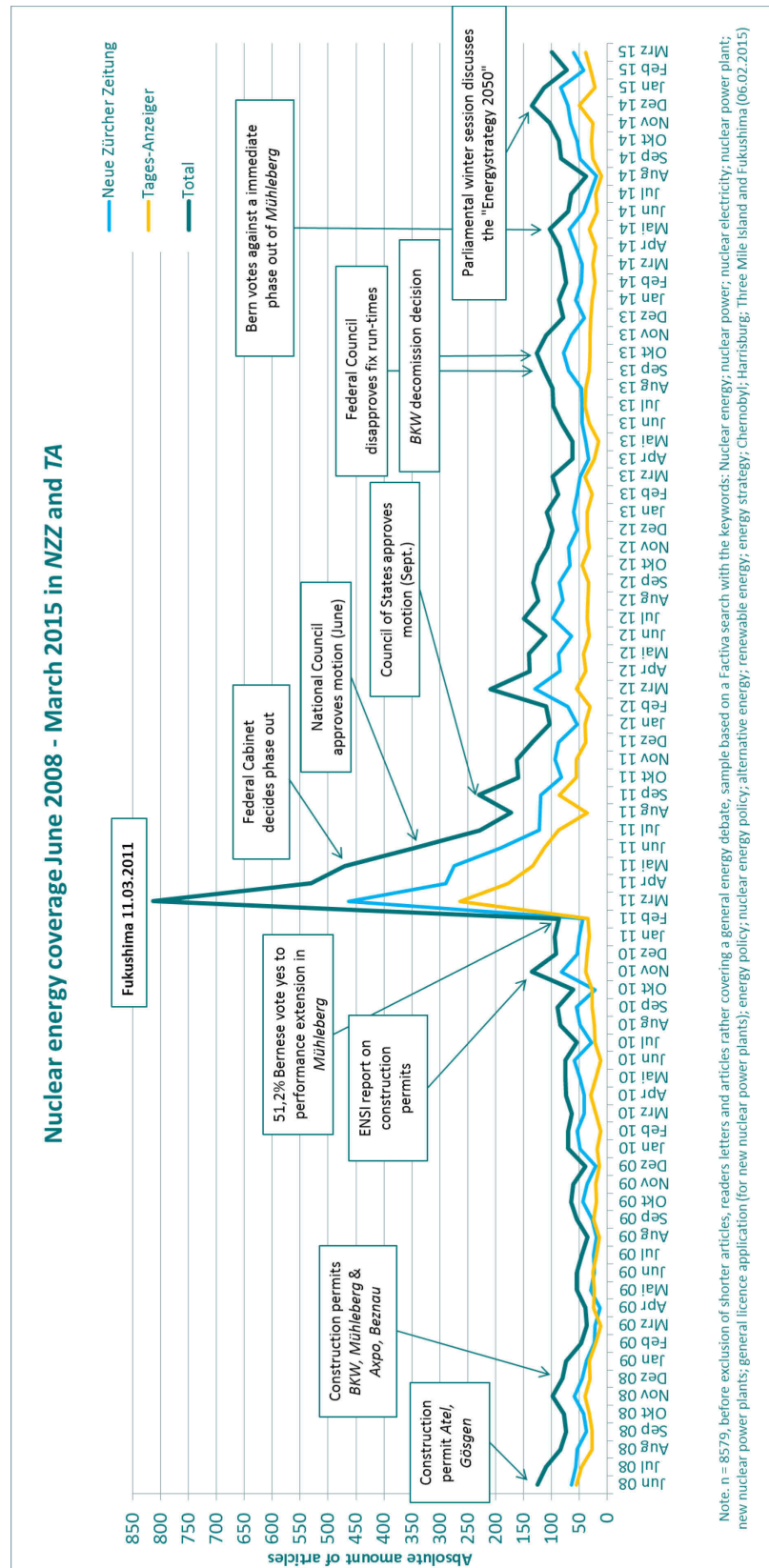


Figure 7 Number of Nuclear Energy Newspaper Articles in NZZ and TA from June 2008 to March 2015

As Figure 7 demonstrates, 2010 was a year of similar amounts of media attention compared to the coverage since 2008. It was, however, not a totally “silent” time period, as can be seen by the peak in late 2010. Therefore, the fourteen and a half months before Fukushima happened were considered a long enough time span to capture media risk coverage before a detriment. In this time period, a positive stance and focus on the benefit of the nuclear energy technology might be observed, especially because of the discussion of power plant building plans since 2008. As this study has previously argued, it is improbable that large energy companies would suggest new nuclear power plants if they had doubts about their chances for building the new power plants. Since nuclear energy has long been an infected topic, it can be assumed that these companies felt that the general opinion would favor their plans at the time.

Figure 7 shows the amount of general energy debate coverage for the two newspapers since 2008, the year when the three nuclear operators submitted their applications for new nuclear power plants. As Figure 7 shows, the years 2008 and 2009 did not have any high peaks of media coverage. There was an ongoing debate, which the newspapers depicted, and in 2010, the time for a decision on the building plans came closer. This, with the referendum in Bern in February 2011, left only one year before Fukushima’s disaster occurred and is enough to capture the debate on how nuclear energy was beheld before the accident. Once the Fukushima event happened on March 11, 2011, the situation changed and triggered a news wave, as well as a renewed debate on the issue. Analyzing media coverage until the end of March 2015 enables us to capture the long-lasting Swiss political debate on the issue. Since the last word has not yet been spoken and a new risk decision has not yet been made definitively, it was of interest to capture the debate during the winter session of 2014 held in the Swiss parliament, as well as the aftermath of this debate, and the fourth anniversary memorial coverage of the accident in March 2015.

8.4. Sampling strategy

The initial sampling in *Factiva* with the listed key words (see Chapter 8.1) resulted in a sample containing 7550 articles in the two newspapers, *NZZ* and *TA*, over the January 2010 to March 2015 time span. Of those articles, 4901 were published in *NZZ* and 2649 were published in *TA*. However, it shall be noted that in this initial sample, although excluded by command in *Factiva*, were also readers’ letters to the newspapers; articles that only in one or a few words mentioned some of the used keywords; news tickers that probably stemmed from the front page of the newspapers; and a few duplications, although the databank excluded most articles that occurred twice in the sample. As previously mentioned, the key words used also captured a rather broad energy debate,

including not only nuclear energy articles. Therefore, a sampling strategy was developed to correct for this. The sampling strategy omitted articles that were:

1. Lacking any mention of nuclear energy;
2. Readers' letters⁴¹;
3. Articles shorter than 69 words, ca. 15 lines in a printed version of those newspapers.

The first sampling premise enabled a sample of only the nuclear energy debate, without articles debating energy issues in general. However, in some articles, nuclear energy is only mentioned in a few sentences. The secondary sampling strategy allowed us to capture a broader context in which the issue of nuclear energy is discussed. This means, for example, that an article can have a main topic of alternative energy sources, but nuclear energy is mentioned in this context. This sampling strategy resulted in a total of 3792 articles over the time span of January 1, 2010 to March 31, 2015.

Out of those 3792 articles, every third article in the time period between January 1, 2010 and December 31, 2010 was analyzed. This resulted in a total amount of 126 analyzed articles for the year 2010. From January 1, 2011 until March 31, 2015, every second article was analyzed. This resulted in a total amount of 1701 analyzed articles for this time period. In the analysis of the data (see Chapter 9), the time period in which every third article was coded (2010) has been weighed to correspond to every second article sampled from 2011-2015. For all years (2010-2015), the final sample included 1827 articles in total, as shown in Table 6.

Table 6 Analysis sample

	TA		NZZ		Total	
Year	n	%	n	%	n	%
2010	43 (65) ¹	6 (9)	83 (125)	7 (11)	126 (189) ²	7 (10)
2011	376	54 (52)	536	47 (46)	912	50 (49)
2012	118	17 (16)	213	19 (18)	331	18 (18)
2013	80	12 (11)	149	13 (13)	229	13 (12)
2014	61	9 (9)	125	11 (11)	186	10 (10)
2015	18	3 (3)	25	2 (2)	43	2 (2)
Total	696 (718)	100	1131 (1173)	100	1827 (1890)	100

Note. ¹ The numbers in parentheses report the weighted sample in order for 2010 to correspond with 2011-2015.

² Irregularities are due to rounding errors and the weight factor.

The smaller sample coded for 2010 is considered conclusive enough for the rather homogenous phase. The coded sample of half of all articles in the years after the accident

⁴¹ Readers' letters were omitted because this study investigates journalistic risk coverage.

does capture a somewhat more detailed picture of the expected climate changes and the media debate of the nuclear issue. A more detailed description of the sample will be given in Chapter 9.1.

To avoid systematic sampling errors of individual coders, the sampling was completed in two steps. For each newspaper and each month separately, the total number of articles for one newspaper and one month existed in PDF format. In the first step, one coder analyzed and coded half of the number of articles that should be sampled in a particular month. The coded articles were given a coding unit number by the first coder. In the second step, the same PDF was given to a different person, who completed the analysis and coding of the second half of the articles for that month. In doing so, the second coder controlled the sampling strategy of the first coder and corrected for any errors, like falsely omitted or coded articles. Whenever questions arose, the author of this study personally assisted the coders in their sampling duties.

8.5. Data gathering instrument

The codebook that was used for the content analysis was developed based on the existing research questions and the hypothesis of this study. Inspiration for the conception of the codebook was taken from previous pilot studies by the author of this study in which nuclear energy coverage had been investigated on smaller scales. The development of the codebook took place from December 2014 until February 2015. During this time, the codebook was tested and revised several times, and for the final coding, the fifth version of this codebook was used⁴². In the development phase of the codebook, the codebook was tested several times on smaller amounts of newspaper articles, discussed and revised. An intercoder reliability test was carried out two times; the results of the second test will be discussed in 8.5.2.

The development of the codebook happened in collaboration with the 15 students of a two semester bachelor's program research seminar organized and held by the author of this study at the Institute of Mass Communication and Media Research (IPMZ) of the University of Zurich, Switzerland⁴³. The actual coding for the content analysis was conducted by a team of those 15 students and two other affiliated students. The coding was carried out during March to mid-April 2015 and was preceded by three months of very fruitful discussions and coder training for the 17 highly motivated students of the coder team. At this time, the first versions of the codebook were used for several pre-codings

⁴² The whole codebook may be seen in Attachment D of this study.

⁴³ A special thank-you goes to the 17 members of the coding team. Thank you for the fruitful discussions and for your great input and work during the coder training and coding period.

of articles from both newspapers that were taken from different points of time in the sample time period. In this way, the coders had contact with articles during several different phases of the nuclear energy debate. This initial code work also enabled the development of a list of commonly occurring topics in this debate. The pre-codings served as the base for discussions of codebook details and its revisions. The extensive coder training was highly important for understanding the codebook and the final data gathering. Based on the discussions and problems that occurred during the pre-codings, the codebook was revised several times.

8.5.1. Operationalization and the codebook

Looking at the final version of the codebook and how it was built up, the operationalization of the hypothesis shall be shown. As can be seen in the overview, Table 7, the codebook was organized into five main blocks.

Table 7 Codebook overview

Main blocks	Variables & variable blocks	
Formal aspects	Coder, article-ID, newspaper, date, length, author, type of article	
Topics	The Fukushima nuclear accident and its consequences	
	Energy (policy) Switzerland	
	Energy (policy) Japan	
	Energy (policy) Germany	
	Energy (policy) other domestic countries	
	Economy Switzerland	
	Economy Japan	
	Economy Germany	
	Economy other domestic countries	
	Environmental catastrophes & climate change	
	Science & technology	
	Risk & safety	
	References to historical nuclear incidents & nuclear weapons	
Bias and general presentation characteristics	Bias	
	Controversy	
	Sensationalism	
	Country of main focus	
Risk analysis	Benefits	Degree / Severity
	Detriments	Probability
	Decision	Uncertainty
Actors & argument analysis	Actor	
	Bias of argument	
Note. See codebook in Attachment D for more details on coding instructions and examples.		

The formal aspects of the articles, e.g., when and in which newspaper the article was published and by whom it was written, were coded. The date of the article was used as a location to different time periods or phases. The second time block made out for one of the main blocks of the codebook. The topics of the articles were coded in much detail. This was to enable a mapping of which topics were discussed in the nuclear debate and how these developed over time. As can be seen in Table 7, there are 13 topic blocks. Those topic blocks consist of finer defined subtopics. Looking at, for example, the first topic block, “The Fukushima accident and its consequences,” the block consists of 21 subtopics. Example subtopics included whether the *course of events* in Fukushima was a topic of the article; whether *time pressure* during the accident was mentioned; and whether the *evacuation* as a result of the accident was a topic of the article⁴⁴. The topic block for “Energy (policy) Switzerland” captured general energy policy topics as well as nuclear energy policy news related to Switzerland. Example subtopics in this block included general *Swiss energy policy* or the *Swiss nuclear phase-out*. The other energy policy blocks were built up similarly. Unsurprisingly, Japan was of special interest, but Germany was also analyzed in detail because of the nuclear phase-out happening there at the time and because Switzerland tended to observe this big neighboring country’s actions. The four economy blocks were also all similar, with subtopics like *economy in general*, *nuclear energy economy*, *costs of nuclear phase-out*, etc. The block for “Environmental catastrophes and climate change” had a subtopic tied to the *earthquake* and the *tsunami of March 11, 2011* and two subtopics concerning the climate, one on *climate change* and the other on *climate protection*. Science and technology as well as the general topic of risk and safety were both one variable blocks. The last defined block contained references to previous severe nuclear accidents, one variable being the *anniversary of Fukushima*, another variable capturing the topic of *nuclear weapons and bombs*. Not listed in Table 7 is a block that allowed the coding of three other topics not mentioned in the previous list, but which seemed recurring or important to the coder. All topics could be coded as not being mentioned at all (0), being mentioned in the article (1), or being the main topic of the article (2). That meant that several topics could be present in one article. However, only *one* main topic was allowed to be coded for each article.

The next block of the codebook captured the bias of articles, as well as general presentation characteristics. Bias of the article gauged whether the article presented arguments in favor of or against nuclear energy technology. This was measured in two steps: the first variable measured the general bias of the article, depending on the topics discussed

⁴⁴ Not all variables of the codebook are discussed here. See the codebook in Attachment D for further details.

in it. That is, if the article discussed the topic of a nuclear energy phase-out, a nuclear energy accident, or other similar topics opposing nuclear energy, then it was coded as being rather opposed to nuclear energy. If, instead, topics such as a referendum result in favor of nuclear energy or new building plans were discussed, then the article was coded as rather in favor of nuclear energy. There was also the possibility to code whether both sides were equally present. Explicitly, this variable did not measure the journalistic bias to the topics, only if the *topics* discussed in the article were per se opposing or favoring nuclear energy. The second variable, however, captured the journalistic performance of putting a certain stance or bias to the issue. Coders were allowed to “read between the lines” to estimate if the journalist purposely presented the issue with bias. Once again, favoring, opposing, or both favoring and opposing could be coded at this point, along with whether the article was truly neutral without any obvious or subliminal bias, only presenting facts without putting any value to them. Controversy was measured in a similar way, allowing for the topic as such to be controversial, as well as the issue itself being presented as controversial by the journalist. An example for a controversial presentation by a journalist could be a sentence like: “Even if nuclear energy is phased out, the question of what to do with the nuclear waste is still not answered.” The sensationalism of the article was measured analyzing whether the author used superlatives like: “the *victims* are *suffering*” or “*giving up* nuclear energy will be *very expensive*”. The last variables in this block measured which country was in focus within the article. Distinguished were Switzerland, Japan and other domestic countries.

The risk analysis block did in detail measure nine different types of benefits deriving from the usage of nuclear energy and 21 types of detriments. Each type of benefit and detriment were coded as not mentioned at all, mentioned as a potential benefit or detriment, or mentioned as an actual benefit/detriment, i.e. it has already occurred or if it was mentioned as potential and actual at the same time. Connected to each type of benefit and detriment were variables measuring if an assessment of the dimension or severity of it was made or not, the probability of it happening, and if uncertainty was mentioned in the context of the particular benefit or detriment. In Table 7 and Table 8, all coded benefits and detriments are listed, and for all of them, at least one example is shown. In angular brackets, a quotation is added to give an example of degree/severity, probability and uncertainty.

Table 8 Risk analysis – benefits examples

Benefit	Citation [Degree] [Probability] [Uncertainty]
Cheap energy	<p>“‘Nuclear energy is cheap if it is well managed’, said Ishihara.” (NZZ 20.07.2011 <i>Atomwaffen für Japan</i>)</p> <p>“According to the official data, nuclear energy costs Japan 5,3 Yen per kilowatt hour, about 5 Rappen, [degree] which is incomparably cheap.” (Tages-Anzeiger, 2011o)</p>
General economic benefit	<p>“For Swiss energy consumers, the German nuclear decision is good news: the longer nuclear power plant run times, the lower the energy prices.” (Tages-Anzeiger, 2010b)</p>
Energy production in general	<p>“The spokesperson of Iran’s foreign ministry, Ramin Mehmanparasad, announced that the power plant Bushehr will start its electricity production next year with a capacity of 1000 megawatt [degree].” (Neue Zürcher Zeitung, 2010b)</p>
Energy supply safety	<p>“Näf believes [uncertainty] that the energy supply safety would be higher also in this country.” (Tages-Anzeiger, 2010b)</p>
Capacity of power plant	<p>“With an overall performance of 1000 megawatts [degree], the Blythe-project has a similar capacity as the nuclear power plant Gösgen.” (Neue Zürcher Zeitung, 2010c)</p>
Efficiency of power plant	<p>“Nuclear energy plants would, seen with today’s safety-technical standards, have the potential life time of a minimum of 60 years [degree].” (Tages-Anzeiger, 2014)</p>
Need for nuclear energy	<p>“[...] the [Japanese] government tries to convince the municipalities, which oppose a power up of the nuclear power plants, of its necessity. Despite the nuclear accident in Fukushima, he [Noda] is convinced that nuclear energy is unalterable for a secure energy supply for an industrial nation like Japan.” (Neue Zürcher Zeitung, 2012)</p> <p>“Because around 50% [degree] of the energy comes from nuclear power plants, the danger of energy shortage in this region is especially high.” (Neue Zürcher Zeitung, 2012)</p>
Environmentally friendly	<p>“[In the report] it was calculated that one kilowatt hour of nuclear energy electricity – ‘all’ inclusive – only causes a bit more than 3 grams [degree] of CO2 emissions because already used uranium is used. Such values are rather low for nuclear electricity.” (Neue Zürcher Zeitung, 2010a)</p>
Independence	<p>“The question has to be asked, ‘How much energy do we want to import?’” (Tages-Anzeiger, 2011m)</p>

Notes. All translations from German to English are made by the author.

The heading of the article is not translated in order to enable accurate identification of the newspaper article.

One example of a benefit is cheap energy prices. If the journalist mentioned this benefit, it was coded; it was also coded if it was mentioned as a benefit to come in the future, i.e. a potential benefit of nuclear energy or something actually present already. The dimension assessment analyzed *if* estimations like “the energy price is *15 percent* cheaper with nuclear energy than it would be without it.” If the journalist discussed the probability of this happening or if she or he mentioned any uncertainties of this happening, this was coded. The detriments were also analyzed in an analogous manner.

Table 9 Risk analysis – detriment examples

Detriment	Citation [Severity] [Probability] [Uncertainty]
Ionizing radiation	"The ionizing radiation in block I had a total of up to 40 milliSieverts [severity] ." (Tages-Anzeiger, 2011n)
	'The danger potential is high,' [severity] emphasizes the former director of the Swiss Federal Nuclear Safety Inspectorate (ENSI)." (Tages-Anzeiger, 2011b)
	"In focus is the question of how the affected reactors are going to impact the outlying surroundings [uncertainty] ." (Neue Zürcher Zeitung, 2011e)
Damage to the power plant	"Yesterday for the first time workers entered block I of the damaged nuclear power plant Fukushima I, which was severely [severity] damaged by a hydrogen explosion on March 12." (Tages-Anzeiger, 2011n)
	"Today a damage to the fuel elements could analytically [uncertainty] lead to, in the worst case, a core meltdown every 100 000 years [probability] occur,' said Michael Prasser." (Tages-Anzeiger, 2011b)
Economy	"If an average price reduction of 5 percent is assumed [uncertainty] , so do nuclear power plants drain the housing market of almost 7 billion Swiss francs [severity] ." (Tages-Anzeiger, 2011c)
Environment	"Longer-term [severity] damage to the environment can no longer be excluded." (Neue Zürcher Zeitung, 2011e)
Nuclear waste	"The disposal costs of the used fuel rods and the clean-up actions in Fukushima are not accounted for." (Tages-Anzeiger, 2011o)
Core meltdown	"The first safety analyses at the end of the sixties assumed a probability [probability] of 1000 to 10 000 years [for a core meltdown]." (Tages-Anzeiger, 2011b)
	"It is very probable [probability] that there has been a partial core meltdown in reactor 1. The government believes [uncertainty] that there might have been such a meltdown also in reactor 3." (Neue Zürcher Zeitung, 2011b)
Evacuation	"Itogawa evacuated on their own because the government did not act fast enough. 2500 [severity] citizens lived [for] three weeks in a sports arena." (Tages-Anzeiger, 2011n)
Susceptibility to failure	"He refers to the two diesel generators, which should drive the cooling system, if the normal electricity supply would disappear. 'Diesel generators, however, have susceptibility to failure,' Aerni criticizes. (Tages-Anzeiger, 2011f)
Economical detriment caused by nuclear phase-out	"Already the cost of imported oil and gas, which covers the shortage now, has pushed the trade balance of Japan to be in the red." (Neue Zürcher Zeitung, 2012)
	"Upon an immediate phase-out of the nuclear power plant, hundreds of millions of Swiss francs [severity] would have to be locked in the waste disposal funds." (Tages-Anzeiger, 2011g)
Energy shortage	"According to his evaluation, an energy shortage of 10% [severity] threatens [uncertainty] to occur." (Neue Zürcher Zeitung, 2012)
	"The probability [probability] of an energy shortage is 100 percent,' said Niklaus Zepf." (Tages-Anzeiger, 2011d)
Rising energy price	"Therefore, energy companies have already announced energy price increases of around 15% to 17% [severity] ." (Neue Zürcher Zeitung, 2012)
Radioactive contaminated or ill humans	"[By a decontamination] it is about removing all possible radioactive particles from the person." (Neue Zürcher Zeitung, 2011d)
	"A severe [severity] radiation sickness will, in most cases [uncertainty] , arise first by a dose of about [uncertainty] 500 mSv." (Neue Zürcher Zeitung, 2011d)
Contaminated water outside power plant	"Also in Tokyo, the iodine-131 contamination [level] exceeded the lower limit of 100 Becquerels [severity] per liter in the drinking water." (Tages-Anzeiger, 2011h)

Detriment	Citation [Severity] [Probability] [Uncertainty]
Contaminated water inside power plant	"They [the workers in Fukushima] worked in the darkness in ankle-deep water, which was highly [severity] contaminated by nuclear radiation." (Tages-Anzeiger, 2011i)
Unlivable area	"The cesium isotope is the reason why the zone around the Chernobyl reactor [severity] is still unlivable today." (Neue Zürcher Zeitung, 2011e)
Economical compensation	"Clearly the economical compensation costs will fall onto the state." (Tages-Anzeiger, 2011l)
Contaminated food	"As long as the citizens are being evacuated in time, and they were in Japan, further areas could become unlivable and large amounts [severity] of food could have to be taken out of the market." (Tages-Anzeiger, 2011k)
Human deaths	"The number of deaths [from the tsunami] will probably [uncertainty] be in the thousands." (Neue Zürcher Zeitung, 2011a)
Human injuries	"Four workers [severity] were injured, and in three, [severity] radioactive pollution was measured." (Neue Zürcher Zeitung, 2011b)
Traumatized or confused humans	"Other than that, the psychological burden on the people is enormous [severity] ." (Tages-Anzeiger, 2011i)
Radioactive contaminated animals	"At the end of April, Japanese scientists measured increased concentrations of radioactive cesium in minke whales." (Tages-Anzeiger, 2011p)
Notes. All translations from German to English are made by the author. The heading of the article is not translated in order to enable accurate identification of the newspaper article.	

Some detriments analyzed were, for example, the radiation of humans, if numbers or estimations were mentioned for how many people were affected, and how probable it would be to have radiated humans if the detriment was not mentioned as already occurring and if the journalist communicated any uncertainty of this happening or not.

Table 10 Risk analysis – decision examples

Decision	
Swiss upcoming decision	"In the coming days, the Bernese citizens entitled to vote will receive information regarding the referendum [Abstimmungsbüchlein]. One central piece of information will however be missing regarding the most important template of February 13, and regarding the consultative referendum over a new nuclear power plant in Mühleberg. That is the information that, in addition, two big interim storage facilities for nuclear waste will also arise." (Tages-Anzeiger, 2011a)
Swiss discussion	"Swissnuclear concluded out of the discussion that [Swiss] citizen will not want a run-time limitation." (Neue Zürcher Zeitung, 2014)
Notes. All translations from German to English are made by the author. The heading of the article is not translated in order to enable accurate identification of the newspaper article.	

The third sub-block of the risk analysis is the decision. Here it was analyzed as if there was a decision mentioned in the article that was distinguished between Switzerland, Japan and other countries and could be coded as a decision not mentioned at all, a decision to phase-out nuclear energy, a decision to keep nuclear energy, or a future decision being discussed, such as an upcoming referendum. An article was coded separately if a discussion, that is, not yet a decision, was mentioned. This variable also included the values for a discussion to phase-out, a discussion to keep, or a discussion issuing both sides, as in, whether or not to keep the technique.

The last block of the codebook analyzed actors and their arguments. An actor is defined as a person, organization, institution, region, or country making a statement that may be directly cited or paraphrased, as well as the actions of the actors being mentioned. There was a list of actors compiled, reaching from different political actors, NGOs, nuclear organizations, economical actors, and affected people to different Swiss regions/cantons. In each article, five actors could be coded, and these five were the most prominent actors of the article as they were either especially emphasized or given the most space. If one actor was mentioned more than once, it was only coded once. The following argument or position of the actor was coded as being in favor or opposed to nuclear energy, or discussing both sides or being neutral to the issue. If an actor was mentioned more than once in an article, the position or bias was derived from all made statements. Bias of the statement was only determined by what was actually written in text. That is, if an actor is well known to be against nuclear energy, but this was not visible in the text of the statement, then the actor's bias was not automatically coded as opposing nuclear energy. Only what the journalist chose to present or emphasize in the statement of the actor was relevant for bias coding.

8.5.2. *Intercoder reliability*

The method content analysis needs a quality measure of the data collection and this can be measured with different statistical coefficients. Based on different calculations those coefficients estimate how often coders agree in their coding. In order to do this the same articles are coded by all coders. With those data an intercoder reliability coefficient can be calculated, which show how often the coders agree and code the same codes. This study has chosen to use the coefficient *Lotus* (λ), which is an intercoder reliability coefficient developed by Benjamin Fretwurst (2015). *Lotus* can take on values between 0 and 1, whereas 1 is 100 percent agreement between the coders. The benefits of using *Lotus*, are that the coefficient is easy to interpret, works well with several coders and is simple to use with the statistical program *SPSS*. What the coefficient shows is the agreement between coders, based on the most common coded value, and it can be inter-

puted as the percentage to which the coders coded the same value (Fretwurst, 2015). For this study a Lotus value of .80, that is 80 percent agreement, is strived for, but lower values will be accepted in some cases, where variables are difficult to code or where lower values can be expected because of high subjectivity variables.

The intercoder reliability test was conducted in the same time period as the actual data collection, March to April 2015. The 17 coders coded 24 articles from *TA* and *NZZ*⁴⁵. Generally the intercoder reliability showed good results, see Table 11. The table show the agreement based on the calculation across variables in variable blocks. The more detailed analysis of each single variable can be seen in Attachment C.

Table 11 Intercoder reliability

Variable block	Lotus
Formal variables (newspaper, date etc.)	.96
Topics	.97 ¹
Bias and general presentation characteristics	.88 ²
Risk analysis	.84 ³
Actors & argument analysis	.83 ⁴

Notes.

¹ The topic variable “risk and safety” is the only topic variable with a lower Lotus than strived for at .73.

² The expected difficulty variables in the bias block were lower than .8, but not so low as to be not interpretable. The general bias of the topics of the articles had a Lotus of .79; the journalistic bias .76; and the controversy of the presented topic was .79. For those considered difficult variables, these values are good.

³ The risk analysis block has several variables with values under .8. The lowest was .72 for the probability to occur variable connected to the detriment susceptibility to failure.

⁴ For the intercoder reliability test for the actors and their arguments, actors were preselected in 12 articles in order to enable a comparison of the follow-up variables, which depends on the actor type. The variables measuring the bias of the actors’ arguments were prone to low intercoder agreements and have therefore been taken out of the analysis.

Overall, intercoder reliability was high enough for the results being used in this study. However, this was not true for the reliability of the actor arguments coding. Those will therefore not be evaluated in this study. Having explained how the data of this study

⁴⁵ The analysis coded up to five actors for each article. It did not matter for the actual coding if the same actors were identified at the same position in the coding. That is, if coder X identified a nuclear operator and coded it under actor 1, but coder Y coded the same actor under actor 2, this did not matter. For the intercoder reliability calculations, this did, however, matter. Because if coder X had a nuclear operator as actor 1, and coder Y had a politician as actor 1, the follow-up variables, like the argument of the actor, will not be correct in the comparison. To solve this problem in the intercoder reliability test, the actors were preselected in a dozen articles. Accordingly, the coders now knew which actor to code as actor 1, 2 and so forth, and the Lotus value could be calculated correctly for the follow-up variables.

was collected, the following section will turn to the data analysis and show the study results.

8.6. Front-page analysis

In addition to the content analysis described above, a front-page analysis was conducted in order to help answer the research question regarding what is known as the media storm. Adapting the operationalization of Boydstun et al. (2014), who first defined the media storm concept, three pieces of information are needed: Is there a 150 percent increase in media attention to the issue, does 20 percent of the news coverage cover the specific issue, and does this intense media focus last for at least one week? The 150 percent increase and the duration of the peak, or media storm, can be assessed by the previously described content analysis. However, if 20 percent of the news coverage dealt with the nuclear issue, an additional measurement was needed since this study did not measure how many articles were published in total *inside* the newspapers. Instead, similar to Boydstun et al. (2014), the 20 percent question was answered by analyzing the front pages and the amount of attention the nuclear energy issue got there. Because the study of Boydstun et al. (2014) does not clearly state whether their front-page analysis measured the area the articles filled, the number of articles in relation to others, or the number of headings in relation to all headings, this study measured all those three dimensions on the newspaper front pages:

1. The amount of space that was given to the nuclear energy issue on the front page was measured in cm².
2. The number of articles that dealt with nuclear energy on the front page compared to the total number of articles on the front page was calculated.
3. The number of headings⁴⁶ dealing with nuclear energy compared to the total amount of headings on the front page was counted.

These three measurements provided enough information to make statements about whether or not the newspapers devoted 20 percent of their (front page) coverage to the nuclear energy issue. For the measurements of the space in cm², spaces on front pages that do not cover news content were excluded. This was, for example, the title of the newspaper, advertising and weather forecasts. The front pages from March 4, 2011 until June 30, 2011 were analyzed, which resulted in 98 front pages per newspaper, since both newspapers do not have any Sunday issues (those are published by separate editorial offices), and their coding was conducted by three of the coders. For the analysis, the

⁴⁶ The amount of headings was counted because news features on the front pages of the newspapers were sometimes only headings referring to articles inside the newspapers.

print versions of the newspapers were used, which had been collected by the author of this study. Since this analysis is an addition to the one question and the hypothesis of this study, it will not be discussed in very much detail in the results part of this study, but instead serve as an additional factor to determine the amount of coverage around the Fukushima accident.

9. Results

This chapter will divide into three main parts. First, an overview of the analyzed sample will be given showing the amount of coverage over time and describing which author types and article types were present in the sample, as well as analyzing the length of articles published over time, and in the two different newspapers. This description of the formal variables will simply give a general overview of the status that nuclear energy has in the newspapers, regarding how much attention it receives and if the newspapers invest in having their own journalists write about the issue or if they publish agency articles. After this overview of the formal variables, a second, more detailed description of results will follow. The results in the first and second parts will serve as a basis for answering the first two research questions and the related hypotheses (see chapter 7):

1. How do Swiss newspapers cover nuclear energy?

The results will show how much media attention the issue gets, which topics and actors dominate this coverage, if the coverage is biased, and whether journalists' accounts are controversial or sensationalized. This will provide new knowledge on recent risk coverage in Swiss newspapers with regard to the nuclear energy issue, adding to what the very few previous Swiss studies have shown already.

The second research question is interested in finding out about risk coverage in general and if risk and its dimensions, as defined in this study, are part of media coverage:

2. How do media cover risk?

Since this study takes the example of nuclear energy coverage, the answers this study will give are foremost true for the risk that nuclear energy stands for. It is a risk with low probability of detriment occurrence and with a possible high severity of detriment. The benefits of the technique are rather straightforward and it is a risk—which in Switzerland historically means citizens are involved to a high degree and important decisions involve large parts of the population.

The third part of this chapter will go into more detail on the changes that Fukushima might have triggered in the way the media cover nuclear energy and risk, aiming to answer the third research question:

3. How is media attention and coverage of nuclear energy different before and after a key event like Fukushima?

This part of this study will also deal with a more detailed phase analysis, addressing the fourth research question and its hypotheses (see chapter 7.1):

4. Does media depiction of risk form a phase pattern?

Can the Risk Attention Phase Model be validated as the tentative proposal suggests? This question will be answered in the last part of the results chapter. For all results presented, the data from 2010 (with every third article coded) has been weighed in order to correspond with the data from 2011–2015 (every second article coded).

Before describing the sample and the formal variables, a timeline shall be presented. This overview of important nuclear energy events will serve as a basis for better understanding the coming results (see Figure 8). The timeline encompasses nuclear energy events that have either triggered a peak in the news coverage or just seem relevant for a better understanding of the context. The timeline stretches from 2010 until 2015 and nuclear energy events that are rather positive are found on the left side of the timeline, while rather negative nuclear events are found on the right side. The timeline does not make a complete list of all nuclear events during this time. The analysis of the events was facilitated by the peaks in coverage and by the analyzed titles of the coded articles.

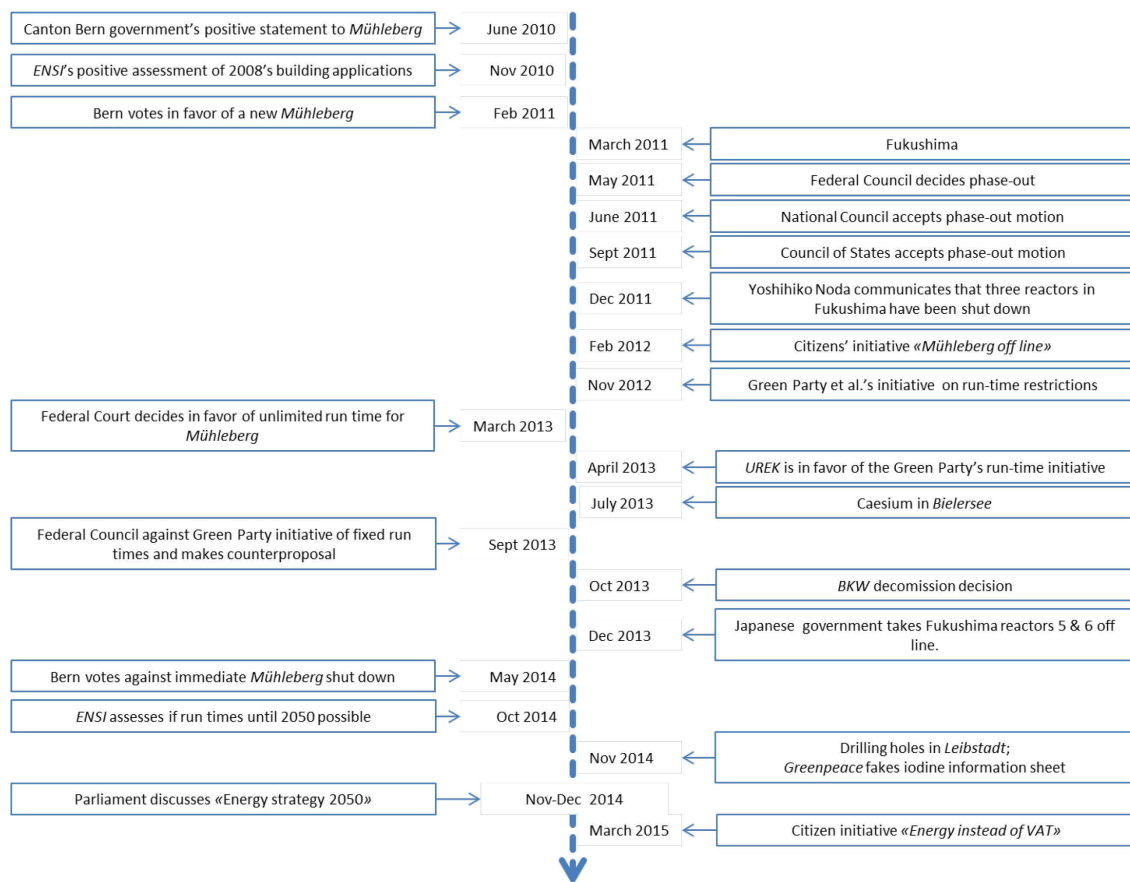


Figure 8 Nuclear energy event time line, 2010 to 2015

9.1. Sample Description

This chapter will show first general results of the content analysis, such as the amount of coverage, the sample size and distribution over time, which authors wrote the articles and of which type and length they were. This will serve to give a general overview of how much the newspapers *invest* in the nuclear energy issue. The variables length of the articles as well as the authorship (journalists versus news agencies) of the articles will give hints in this direction.

9.1.1. Amount of coverage

This section goes into more detail on how the sample came to look for this study. Given the keywords used in the *Factiva* search, Figure 9, shows the total number of nuclear energy articles per month, from 2010 to 2015. The peak of March 2011 is striking, as there were over 500 articles published that month in the newspapers *TA* and *NZZ*.

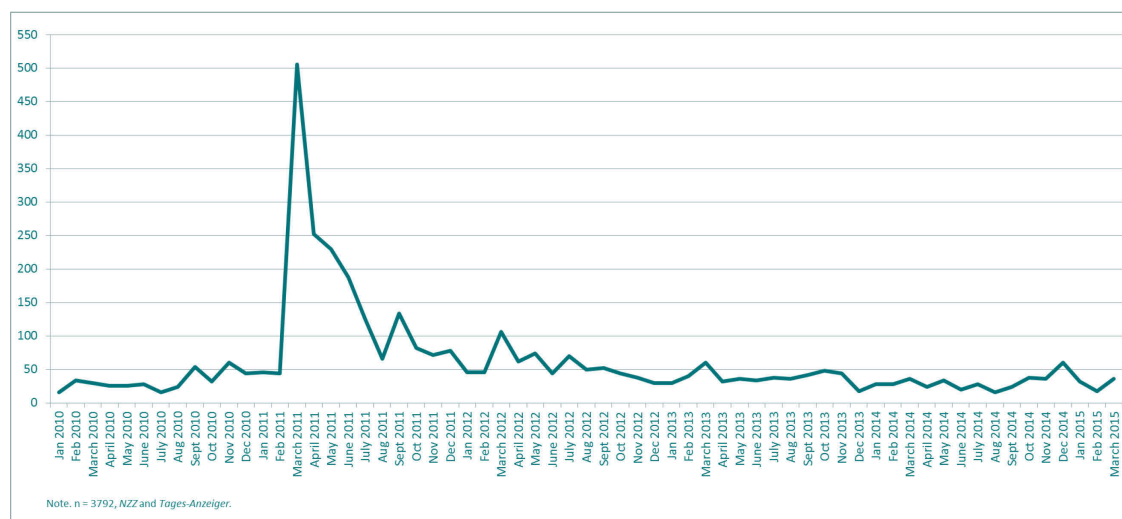


Figure 9 Overview of the total number of nuclear energy articles in NZZ & TA from January 2010 to March 2015

Figure 10 shows the number of articles for each newspaper separately after sampling of every third article in 2010 and every second article in 2011–2015. However, in this graph the data from 2010 have been weighted in order to correspond to the rest of the data. This means, the actual number of 126 coded articles in 2010, after weighting, makes for 189 articles, or ten percent of the whole sample, instead of the 6.9 percent before weighting.⁴⁷

What Figure 10 reveals is that *TA* publishes fewer articles on nuclear energy than *NZZ*. Only a handful of times did the *TA* coverage peak over the *NZZ* coverage, as seen, for example, in January 2011, July 2011 and June 2012. The answer to the first hypothesis one is that media do give more attention to nuclear energy when an accident occurs, which is in line with previous studies (Gamson & Modigliani, 1989; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986).

⁴⁷ In the following analysis the 2010 data will be weighted to correspond with 2011–2015. In every case this will be indicated in the legends to figures and tables.

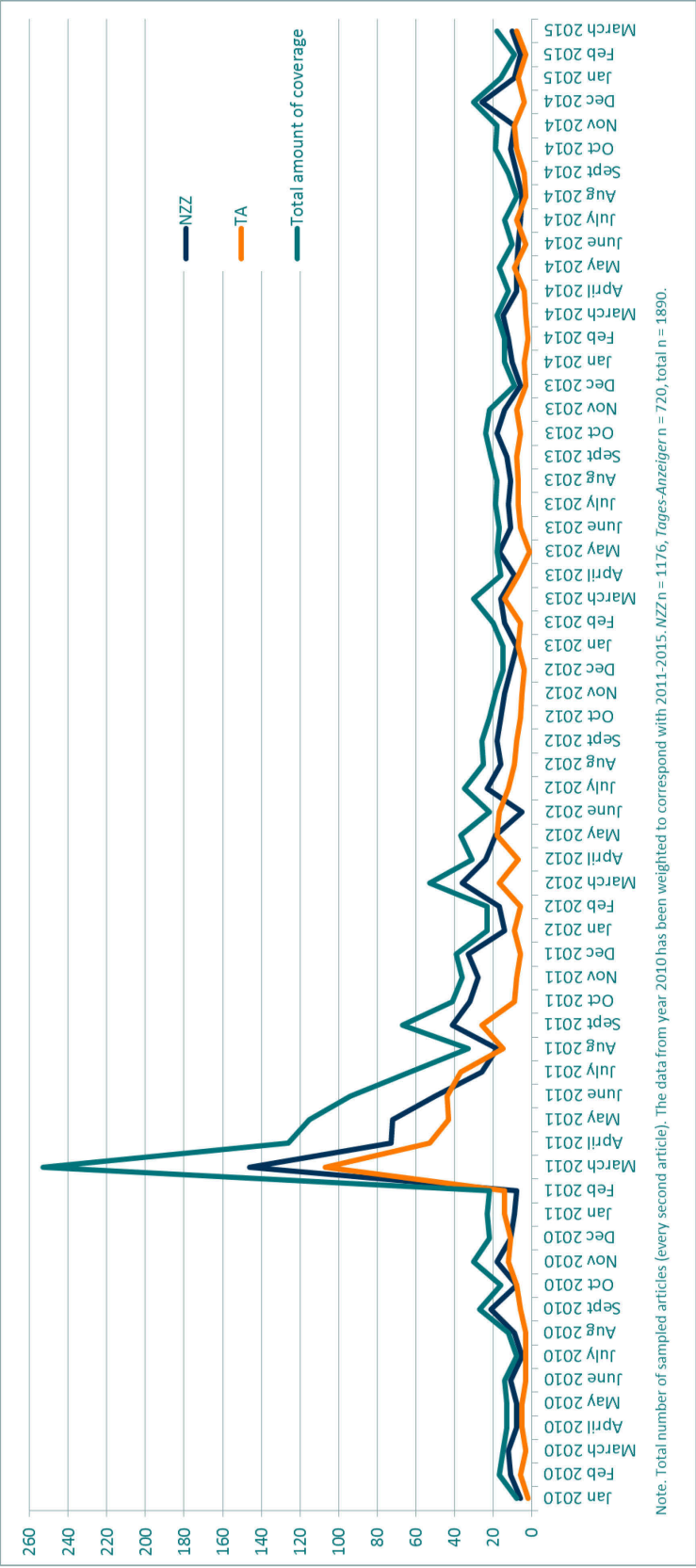


Figure 10 Sample overview

9.1.2. Author and article types

To answer the question of who wrote those news articles, the left column in Figure 11 shows the author types of the articles in both newspapers. The majority of articles, 77 percent, were written by journalists, while one-fifth stemmed from news agencies and three percent were written by other authors like politicians or actors from industry. This suggests that the nuclear energy issue is an issue which newspaper rate as important, since they invest time to cover themselves.

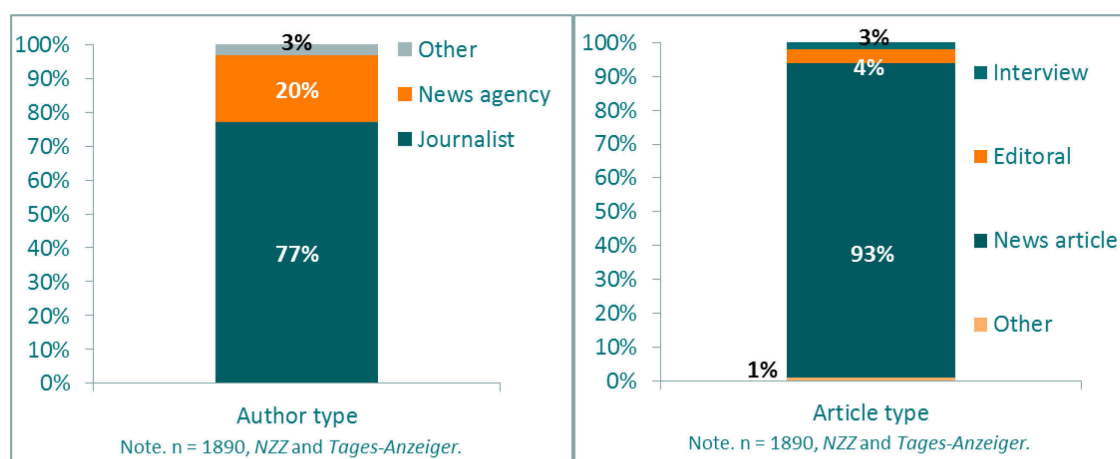


Figure 11 Author and article types

The right column in Figure 11 reveals the types of communications driving coverage of the nuclear energy issue. The dominating format was news articles, accounting for 93 percent of all coverage; Three percent were interviews and four percent were editorials.

Therefore, even if the issue is one that newspapers would want to communicate their own opinion through editorials, this means is not much used.

9.1.3. Extent of coverage

The extent of the coverage was measured by the length of the articles, using exact word counts. Over the whole sampling period, the mean length of the articles was 433 words. This corresponds to almost one-third of a page in the printed versions of newspapers (1/3 page is approximately 460 words). The length of the articles becomes interesting in different comparisons. For example, it is interesting to see in which periods the issue was covered in longer articles—understood to be a measurement of journalists giving the topic more extensive attention and deeper coverage. In Figure 12 the mean of the length of the articles is visualized over the whole sample period from January 2010 to March 2015. The lighter orange horizontal line shows the overall mean length of articles across the sample. The mean article length in March 2011, the month of the Fukushima

disaster, is 510 words. That is slightly more than one-third of a page, or not quite half a page (1/2 page is approximately 700 words). Unlike the much more prominent peak visible in Figure 9, which shows the total number of nuclear energy articles, the longer-than-average articles covering the nuclear issue in March 2011 did not result in such a prominent peak. In addition, Figure 12 points out peaks where the average length of articles exceeded the average length of the accident month. This happened six times. In March 2010 (weighted $n = 10$) and May 2010 (weighted $n = 13$), the mean length of the articles was similarly high to the mean in March 2011 ($n = 253$). Those two months were both before Fukushima happened and during a time where there were not any peaks at all in the numerical count of articles (see Figure 10). In February 2012 ($n = 23$) the average length of articles was again similarly high as in March 2011. This was also a month with quite few articles. The month with the highest peak in the average length of articles is December 2013 ($n = 9$). But here also there is no peak in the number of articles published for this month. The last two length peaks are found in February 2014 ($n = 14$) and February 2015 ($n = 9$). Those, too, are months in which there is no peak in the number of newspaper articles on the issue.

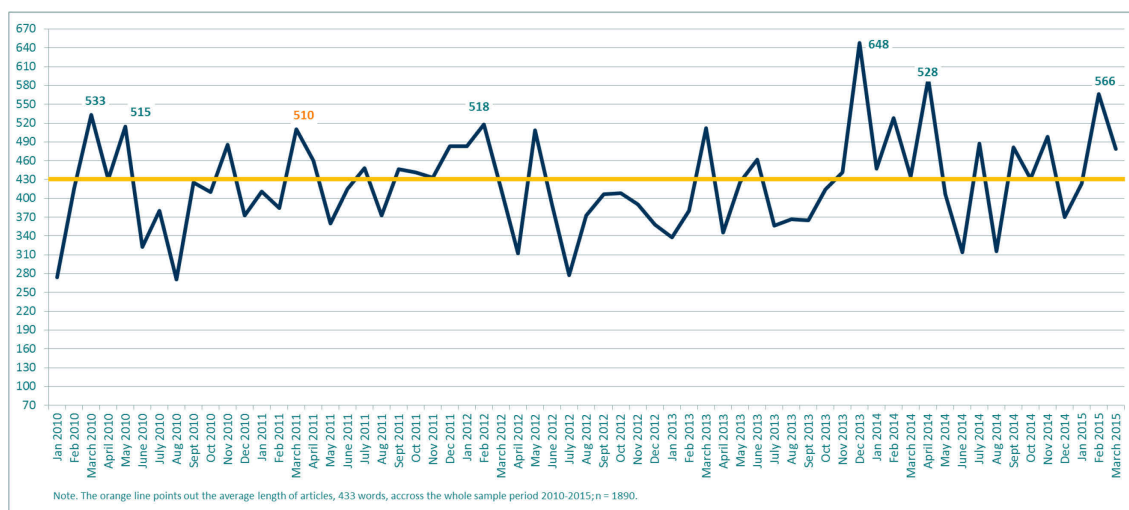


Figure 12 Average length of articles per month over the whole sample period

We have seen that the two newspapers differ in the number of news articles they publish on the issue; do they also differ in the article length? Figure 13 answers this question. The overall average length of *NZZ* articles was 404 words ($n = 1176$, $SE = 9$), whereas *TA* published longer articles with a mean of 480 ($n = 720$, $SE = 11$). This mean difference of 76 words, was significant $t(1888) = 5.3$, $p = .000$ in the independent t-test. To show an overview of the article length in the newspapers, the length has been categorized into four standards:

1. Less than one-fourth of the newspaper page;
2. longer than one-fourth but shorter than half a page;
3. longer than half a page but shorter than three-fourths of a page; and
4. one whole page or longer.

Overall, most articles (46%) were shorter than one-fourth of a page; 37 percent were longer than that, but still shorter than half a page; 13 percent were longer than half a page, but not quite a whole page; and only four percent were one page or longer. Regarding the length of the articles in the two different newspapers, *NZZ* had an absolute number of longer articles than *TA*. However, as can be seen in Figure 13 the relative numbers show that the articles in *TA* were, in general, longer than the ones in *NZZ*.

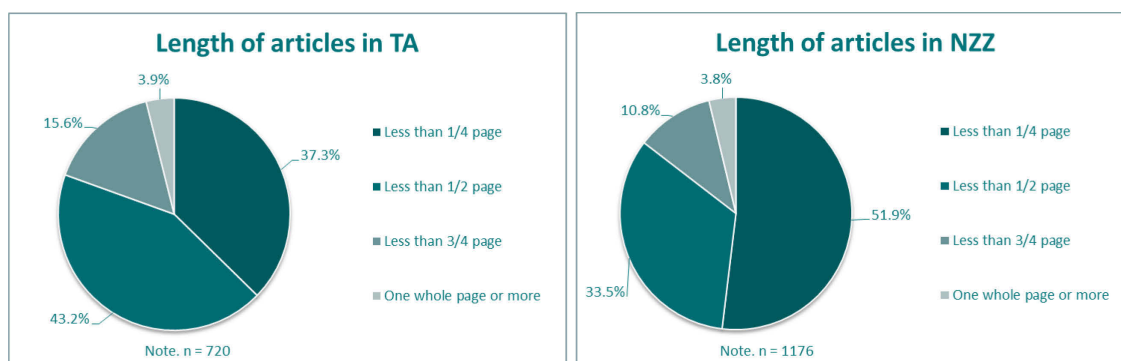


Figure 13 Length of articles in *TA* & *NZZ*

Whereas half of *NZZ*'s published articles are shorter than one-fourth of a page, *TA* published 37 percent of its articles in this category. Most of *TA*'s articles (43.2%) were longer than one-fourth of a page but shorter than half a page. Although both newspapers published around four percent of their articles one page and longer, *TA* published 15.6 percent longer than half of a page but shorter than three-fourths of a page, while *NZZ* had 10.8% of its articles in this category. In short, *TA* published fewer but longer articles on nuclear energy compared to *NZZ*. These results suggest that the newspapers invest their resources slightly differently when covering the issue. The higher number of articles in the *NZZ* brings about the assumption that the issue is dealt with more often but probably also in more different desks than is the case in *TA*. The longer articles in *TA* might point to a more in-depth coverage of the issue when dealt with. Because of these slightly ambivalent results, it is difficult to say that one newspaper invests more resources than the other when covering the issue.

9.2. Descriptive Results

After an overview of the sample has been given, this chapter will now describe the general analysis of the topics, the actors, whether there is a bias in the coverage, and if journalists report in a controversial and sensationalistic manner as well as address the hypotheses two and three. The risk dimensions will also be analyzed here, looking at general changes over time. This will give a detailed insight into how media cover nuclear energy; those results will then be analyzed, going into more detail of a tentative phase model in chapter 9.6. The presentation of the descriptive results following will more or less adhere to the structure of the codebook (see Table 7). Many of the figures will indicate the 95 percent confidence interval, which shows “that in 95% of samples the true value of the population mean will fall within its limits. [...] By comparing the confidence intervals of different means (or other parameters) we can get some idea about whether the means came from the same or different populations.” (Field, 2013, p. 58). When comparing many different means or percentages, as this study does over time, it is visually possible with the 95 percent confidence interval to see if results are significantly different from each other. Field (2013) discusses this and refers to Cumming and Finch (2005). They explain that if the end of the lines of the confidence intervals just about touch each other, the results of the difference between the parameters is significant on approximately a level of $p = .01$. If there is a clear gap between the end of the confidence interval lines, then p is lower than $.01$. By a, what they refer to as a “moderate overlap,” p is $.05$. This moderate overlap, however, needs closer attention (Cumming & Finch, 2005; Field, 2013, p. 71). In this study, in any case of overlapping confidence intervals, a statistical procedure will be applied in order to show the exact p -value.

9.2.1. Topics

What topics have the media in their coverage of nuclear energy been discussing, and what context does this media coverage create for the issue of nuclear energy? Is nuclear energy presented mainly in a political context regarding topics and actors (H2)? To answer these questions, this study has analyzed the topics in every news article. The analysis has captured all topics that were mentioned in the articles as well as one main topic for every article. In addition to single topics, blocks of similar topics were created, for example, compiling all topics that have a direct connection to the Fukushima accident (see codebook description in chapter 8.5.1). To get an overview of the discussed topics, this chapter will first show the mean frequency with which the topic blocks were occurring over the whole of 2010 to 2015. After that, the description will go into details for

each year, first showing the topic blocks over the whole year and then concentrating on the most prominent topics and showing their development over the months.

Figure 14 shows the average frequency with which topics occurred over the years 2010 to 2015. The topic blocks have been recoded to dummy variables, enabling a mean comparison of which topics dominated the coverage. Some topic blocks have been slightly changed from original coding in order to make them more conclusive. For example, the topic block *natural catastrophes 11.3.11* has been put together by the two topic variables capturing the seaquake and tsunami that occurred in Japan March 11, 2011.⁴⁸ As shown in Figure 14 Swiss energy policy is on average significantly the topic being covered the most in the two newspapers. In 55 percent of all articles the Swiss energy policy is either mentioned or the main topic of the coverage. Even with the long time period of five years that this study analyzes, the Fukushima accident is the second most covered topic. In 44 percent of all articles, it is mentioned or is the main topic. The third topic is general mention of the risks of nuclear energy, or safety issues (37%). This shows that nuclear energy is mainly covered as a political issue, a focus which however changes when accidents happen and risk and safety are discussed. As can be seen by the fourth most covered topic, nuclear energy is also discussed by the media in economic contexts. The general Swiss economy is mentioned or the main topic in a fourth of all articles. As the theoretical approach of key events predicts, similar topics to the key event will be covered more by the media after a key event. In looking to other nuclear accidents and how often they are mentioned on average over the years, it seems they are mentioned or are the main topic in 13 percent of the coverage.

⁴⁸ Another topic block that has been put together other than as occurred in the codebook is *other nuclear accidents*, which contains the variables measuring mentions of the nuclear accidents in Lucens (Switzerland), Three Mile Island (USA), Chernobyl (Ukraine), and other nuclear incidents in Switzerland and in other countries. The topic block *climate change or protection* was set together by the variables capturing if climate change or global warming were mentioned as well as by the variable capturing climate protection.

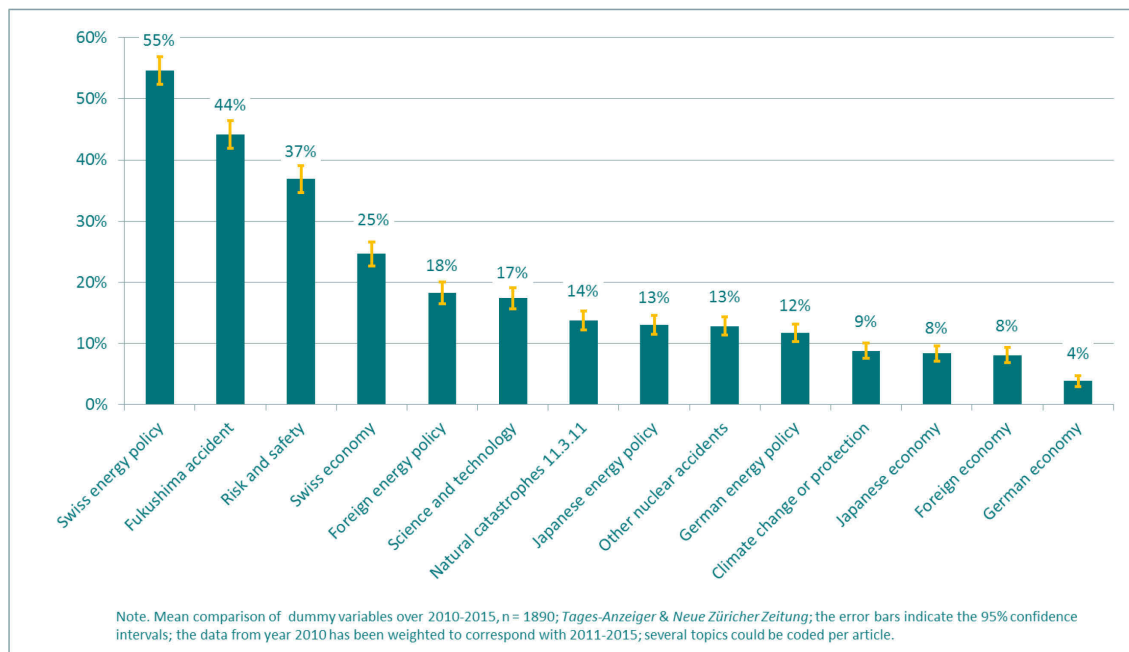


Figure 14 Topics of the coverage, 2010 to 2015

However, looking at Table 12, it seems that the specific topic of other nuclear accidents is not mentioned more in 2011 when compared to 2010. In 2010 other accidents are mentioned in 16 percent of the coverage, whereas they are covered on average in 14 percent in 2011. The difference, however, is not significant⁴⁹, which also points to the fact that at least other nuclear accidents are not covered more after Fukushima happened. In the following analysis of the topics in the single years, the development of the topics shall be shown and this will inform which topics have dominated the coverage, as well as whether there have been changes over time.

⁴⁹ The significant differences referred to here are based on the 95 percent confidence interval analysis, which can be seen in the figure in Attachment A.

Table 12 Topics 2010 to 2015

Topic	2010	2011	2012	2013	2014	2015
<i>All numbers are percentages</i>	n = 189	n = 912	n = 331	n = 229	n = 186	n = 43
Swiss energy policy	56	49	52	66	69	77
Fukushima accident	0	61	42	34	27	23
Risk and safety	22	39	34	41	42	35
Swiss economy	25	19	24	39	32	33
Foreign energy policy	28	16	21	16	21	19
Science and technology	10	20	20	10	18	14
Natural catastrophes 11.3.11	0	22	11	8	2	2
Japanese energy policy	3	12	24	11	10	12
Other nuclear accidents	16	14	10	10	17	7
German energy policy	25	12	8	7	7	9
Climate change or protection	19	9	8	4	6	0
Japanese economy	1	10	24	4	5	5
Foreign economy	10	6	11	7	13	0
German economy	10	3	5	2	4	2

Note. The three most mentioned topics per year are written in bold numbers.

The data from year 2010 has been weighted to correspond with 2011-2015.

Several topics could be coded per article.

The 95 percent confidence intervals for those values can be seen in the figure in Attachment A.

In looking closer at changes in topics over the years, Table 12 demonstrates that, for 2010, the most discussed topic on average (see footnote 49) was Swiss energy policy (56%). That the second and third most covered topics were foreign (28%) and German energy policies (25%) points to the issue that nuclear energy was clearly a political discussion in the year before Fukushima happened. Ranking just after the Swiss economy (25%), the category of risk and safety (22%) illustrates that the issue is not only one of policy and economy, but also one of potential risk and safety issues. However, with regard to these four main topics, none are covered significantly more or less than the other. This might point to a media coverage that is quite diverse and covers a broad set of topics. But when looking at the topic dominating coverage in 2011 it becomes clear that the climate changed. Swiss energy policy is, nonetheless, occurring on average in the same number of articles as in 2010 (56% vs. 49%) (see footnote 49), but the dominating topic of 2011 is the Fukushima accident, which occurs in 61 percent of all articles, significantly more than the Swiss energy policy (49%). Foreign and German energy policy as well as the Swiss economy get pushed down by the topic of risk and safety, which is covered in 39 percent of all articles in 2011. The natural catastrophes of March 11, 2011 are covered in 22 percent of the articles, significantly less than, for example, risk and safety, but not significantly more than science and technology and the Swiss economy. In 2012 the Swiss energy policy was again the most covered topic, as it was covered in every second article. The Fukushima accident was still covered in 42 percent of all articles. Risk and safety (34%) stayed on a significantly higher level than the

Swiss economy topic (24%). In 2013 the Swiss energy policy becomes even more a topic in focus, as Table 12 shows. It is covered in 66 percent of all articles and is by far the most covered topic. The next three following topics are not significantly different from each other; they are: risk and safety, the Swiss economy, and the Fukushima accident, which dropped down to a 34 percent mention in all articles. 2014 was, again, a year dominated by the topic of Swiss energy policy (69%). Risk and safety was still a much covered topic (42%) as was the Swiss economy, which was present in a third of all articles, followed by the Fukushima accident. The pattern of 2014 more or less stays the same in 2015⁵⁰. In chapter 9.6, those results will be analyzed and interpreted in more detail. Given these results, the answer to the first part of hypothesis two is that the *NZZ* and *TA* are in line with the results of previous studies presenting the nuclear energy issue in a political context (Arlt & Wolling, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986; Teichert, 1987).

9.2.2. Actors

Given that different persons, organizations, and speakers—i.e. actors—are cited, paraphrased or mentioned in media coverage, this study asks, which actors are present in the media coverage and assume based on previous results (Arlt & Wolling, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986; Teichert, 1987) that mainly politicians are mentioned in the coverage? Assuming that a journalist specifically targets actors who will provide arguments that support the opinion of the journalist himself or that of the newspaper and deliberately gives them space and opportunity to speak in the media coverage, (see Kepplinger, 1988, p. 678 on *instrumental actualisation*), this is an interesting question. Even if it is not the case that the journalist targets and covers only those arguments in line with her or his own, this is a relevant question. Actors that are presented, cited or mentioned in the media coverage have the potential of influencing general public opinion. Therefore, to answer the question of who is “speaking,” this study has coded five actors in every article. An actor is defined as a person or institution that is cited directly, paraphrased, or made mention of others. In the articles, if more than five actors were “speaking,” the five most prominently mentioned were coded as the actors that were given the most attention or space by the journalist. In articles where fewer than five actors were speaking, those variables were left empty.⁵¹

⁵⁰ Keeping the smaller n for 2015 in mind.

⁵¹ To provide a better overview, the category “no actor” has been omitted in the following figures in this chapter.

This chapter will first show which actor types were present in the coverage overall from 2010 until 2015. Differences between the newspapers will be discussed before each year is described in more detail. For a clear understanding, it is important to remember there are two ways to account for percentages regarding the actor analysis in this study. The analysis captured 9428 actors in 1890 coded articles. When wanting to know the relative amount of one actor type in relation to the absolute number of actors, the 9428 actors will stand for the 100 percent. This results in statements like: 18 percent of all actors were Swiss politicians. If, instead, the interest is in knowing how many of the 1890 articles mention a specific type of actor, the 1890 articles will make for the 100 percent. Since five actors can be coded in each article, when calculating a percentage based on the absolute number of articles, the percentage regarding the actors will not add up to 100 percent, but will instead go over 100 percent. This analysis results in statements worded like: In 37 percent of all articles, at least one Swiss politician was speaking.

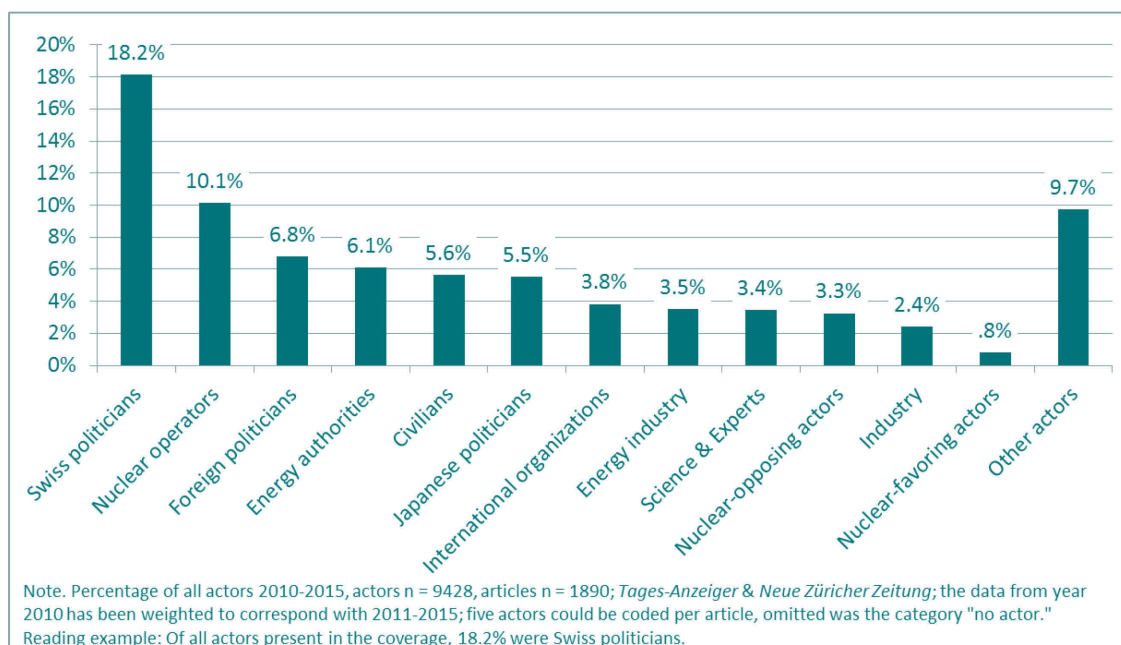


Figure 15 Actor types present in the coverage 2010-2015

Starting with looking at the percentage of all actors coded over the whole sample period, Figure 15 gives an overview of the actor types. All in all, 9428 actors were identified in the 1890 sampled articles. That means, on average, almost five actors in all articles ($M = 4.98$). Of all those actors, Figure 15 shows what percentage of those were, for example, Swiss politicians or nuclear operators. Swiss politicians accounted for 18.2 percent of all actors, thereby claiming the distinction of the actors speaking the most in the media coverage. The second most cited actors were nuclear operators, as they made up 10.1 percent of all actors. These results point to the answer in the second part of hy-

pothesis two, that the nuclear energy issue is mainly related to policy actors, as previous studies have shown (Arlt & Wolling, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014; Saxer et al., 1986; Teichert, 1987).

In Figure 16 the percentage accounted is different. The figure instead shows the percentage of articles in which at least one actor of the type spoke. This means, in 37.5 percent of all articles there was at least one Swiss politician speaking and in almost the same number of articles (37%), at least one nuclear operator was cited. Since, for example, all five coded actors could be of the same type, this result, when compared to the percentage of all actors (Figure 15), leads to the question how many actors of each type were cited in one and the same article? It is an interesting result that is seen in Figure 16. In the same number of articles, there was at least one Swiss politician or a nuclear operator speaking. If looking at which topics were the most prominent in the coverage, it does not surprise that Swiss politicians are so prominent, but what might be more surprising is that nuclear operators' statements are covered so often.

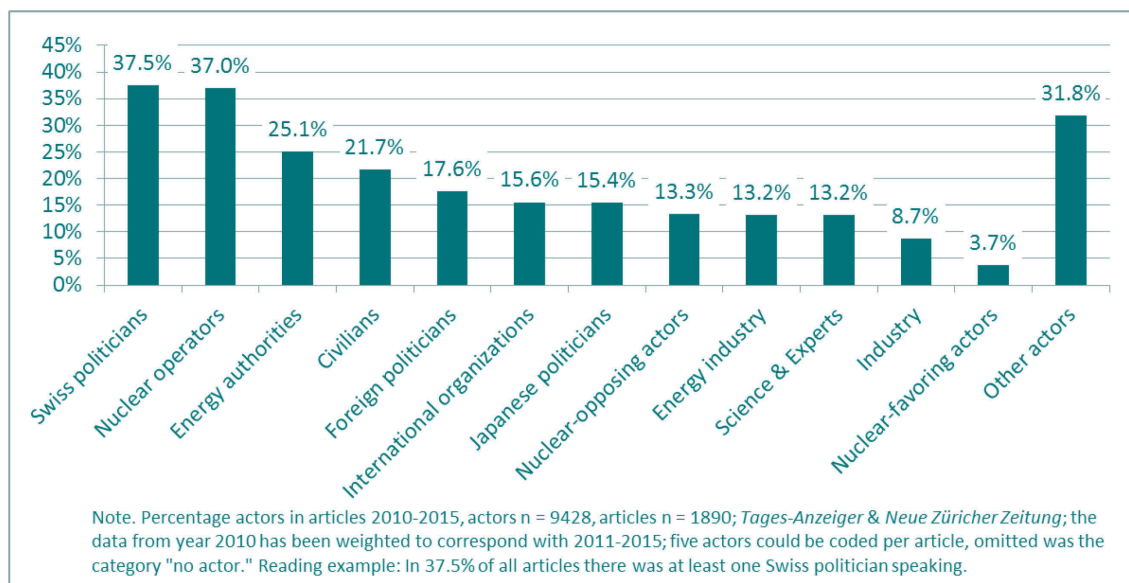


Figure 16 Percentage of actors present in the articles 2010-2015

Asking if actor types mostly speak alone or whether, in the same article, more than one actor of the same type speaks, is an interesting question, because it shows if the journalist presented different voices in one and the same article, or whether s/he rather only let one actor of each type speak. If looking only at the three most commonly cited actors—Swiss politicians, nuclear operators and foreign politicians (Figure 17) analysis shows that, in 63 percent of all the articles, there are zero Swiss politicians speaking. In 13 percent there is one Swiss politician speaking and in 25 percent there are two or more Swiss politicians speaking in the same article. There are about the same number of arti-

cles that do not have a single nuclear operator speaking, also 63 percent. In 27 percent there is one nuclear operator, and in 10 percent there are more than two. In 82 percent of the articles there are no foreign politicians, in 9 percent there is one, and in 9 percent there are two or more. These results demonstrate that in 25 percent of the articles, more than one Swiss politician was speaking. Since politicians often represent a specific opinion, it seems important to cite more than one politician, in order to obtain a diverse opinion climate in the articles. The lower number for nuclear operators showing that they mostly (27%) speak alone seems logical, for two reasons: First, there are not as many nuclear operators as there are Swiss politicians. Second, they all tend to have similar (economic) interests. In addition, one can imagine an article covering a specific nuclear power plant and that the nuclear operator of this specific plant might be asked for a statement, whereas politicians might be asked just for the journalist to show the opinion landscape.

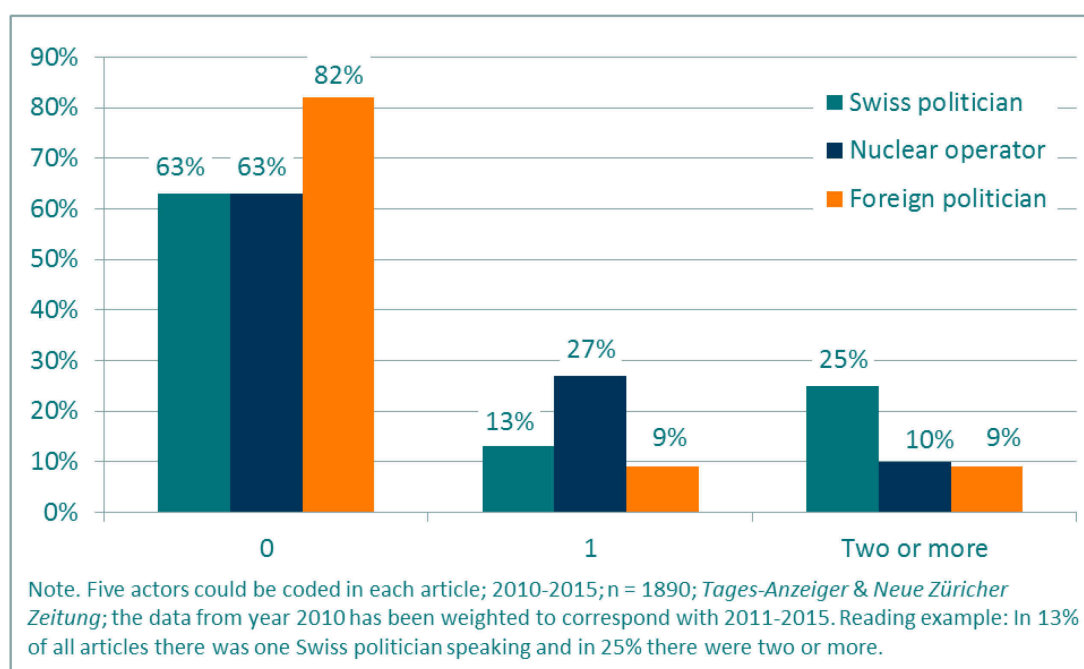


Figure 17 Percentage of the same actor type in the same article

In Figure 18 the mean number of actors of the three most common types, Swiss politicians, nuclear operators and foreign politicians, are compared over the years. And here the mean is calculated on the absolute number of actors speaking. This means that the maximum number of actors could be five; if the average is one, then there was, on average, one actor of that type in each article that specific year. The average number of articles with foreign politicians is significantly higher in 2010 compared to the following years. The average of Swiss politicians also varies over the years. In 2010 and 2011 the means are not significantly different from each other. However, the average number of

Swiss politicians being cited in 2012's coverage is significantly smaller than in 2011 and 2015. In 2013 the average number returns to the level of 2010 and 2011 and stays there until 2015. Across the years there is no significant increase or decrease of the average number of nuclear operators speaking.

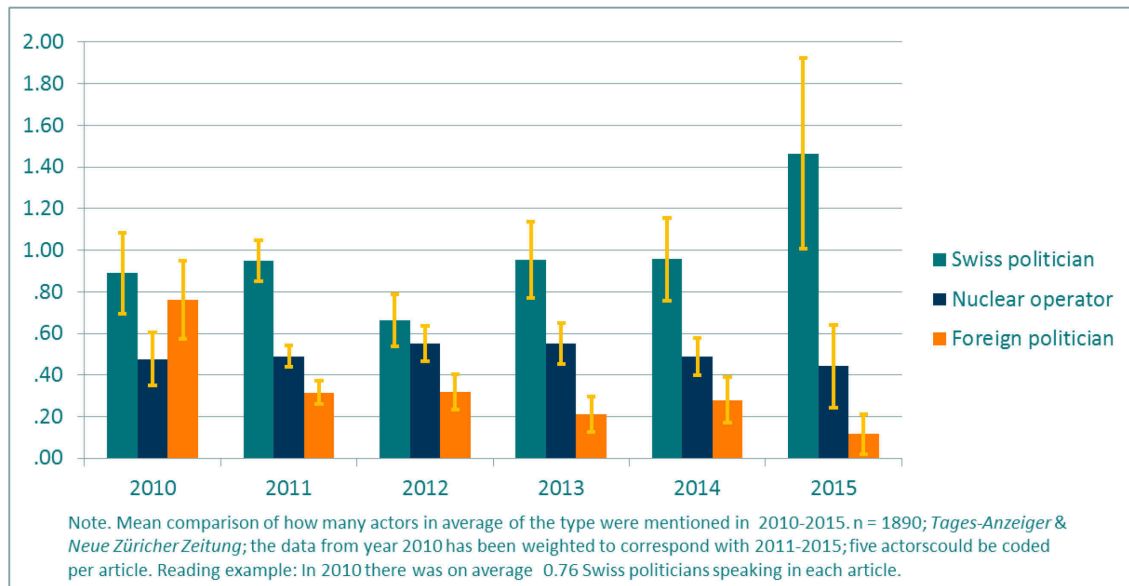


Figure 18 The three most cited actors, 2010 to 2015

Thus in 2010, the most cited actors are Swiss politicians and foreign politicians, and their means are not significantly different from each other. However, nuclear operators are cited significantly less than both other types. In 2011 this changes as Swiss politicians are significantly more often cited than both the other actor categories. Nuclear operators are also significantly more often cited than foreign politicians. This particular pattern stays like that until 2015. In 2012, however, the average number of Swiss politicians and nuclear operators mentioned are the same in the articles. Again in 2013, Swiss politicians exceed the number of nuclear operators, and this pattern remains until 2015. The next pressing question is if there are differences between the newspapers.

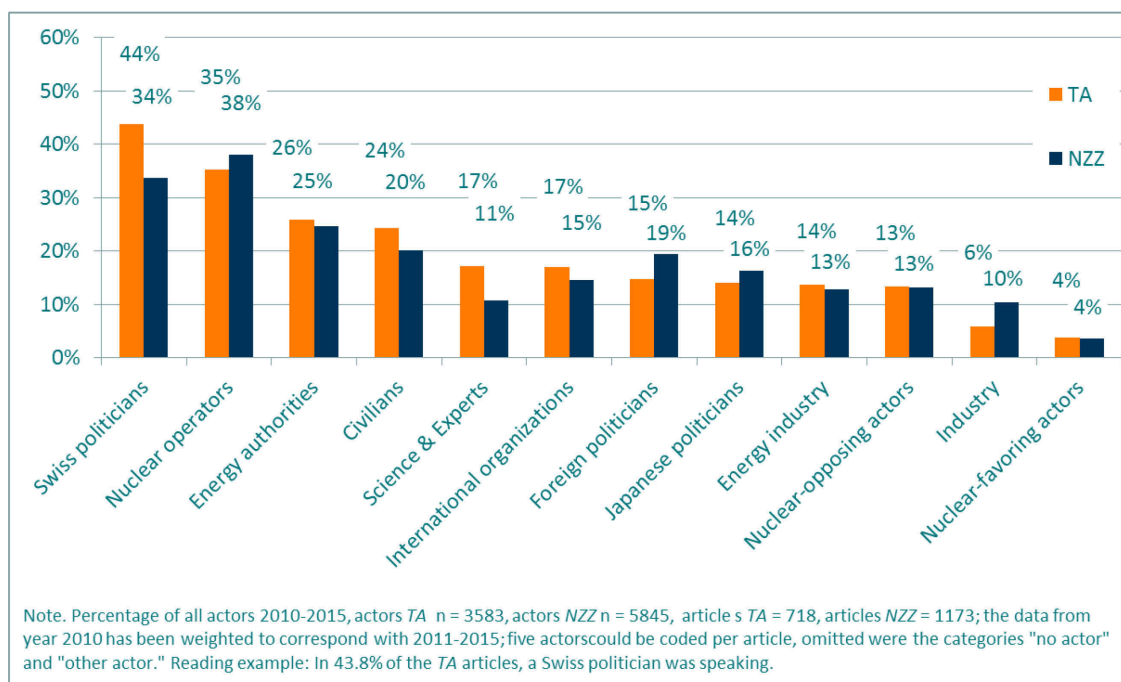


Figure 19 Actor types present in the coverage of TA and NZZ

Both newspapers on average let at least five ($M = 4.9$) actors speak in every article. As Figure 19 shows, of the 3583 actors cited in *Tages-Anzeiger*, 43.8 percent were Swiss politicians, a number that was ten percent lower in *NZZ*, as 33.6 percent of the 5845 actors cited in *NZZ* were Swiss politicians. Instead, *NZZ* had a slightly higher percentage of nuclear operators (38.1%) than *Tages-Anzeiger* (35.2%). *NZZ* is known for its focus on foreign and economic news, and this is depicted in the fact that there are more foreign and Japanese politicians speaking in *NZZ* than in *Tages-Anzeiger*. Also, the higher percentage of general industry actors present in *NZZ* fits with its profile. Accordingly, it seems that the newspaper journalists choose the actors that they give opportunity to speak by the general line of the newspaper, as Kepplinger states with his approach named *instrumental actualisation* (Kepplinger, 1988, p. 678). *Tages-Anzeiger*, being a rather national-orientated newspaper, fits well with the result that it lets more Swiss politicians speak. However, the interesting result for both newspapers, despite their different opinions on nuclear energy, is that they let an equal number of nuclear-opposing (13.3%) as well as nuclear-favoring actors (3.8% vs. 3.6%) speak. This result could go against Kepplinger's *instrumental actualisation*. According to his theoretical approach, there should be more opposing actors speaking in *Tages-Anzeiger* than in *NZZ*. And in fact, there are slightly more favoring actors speaking in *Tages-Anzeiger's* coverage (3.8%) than in *NZZ's* (3.6%). However, this difference is so small that it rather shows that the same percentage of articles in both newspapers presents nuclear energy—

favoring actors.⁵² Returning to hypothesis two it seems *TA* has a slightly more prominent policy context to the issue of nuclear energy, whereas *NZZ*, at least regarding the actors, has a slightly more economic-political context regarding the mentioned actors.

9.2.3. *Alignment of article topic*

Arguing along similar lines as bias studies in general, media coverage can be positively or negatively slanted. This study measures this using two different variables. The first variable captures whether the topics discussed in the article are rather negative or positive for the presentation of nuclear energy. Topics like planning new nuclear power plants were considered to be positive (coded 1) and topics like the Fukushima accident or nuclear phase-out were considered to be negative (coded -1). The variable also captured if the topic was neutral or not clearly negatively or positively slanted (coded 0). The second variable, which will be discussed in chapter 9.2.4, instead analyzes if a journalist gives an issue a positive or negative slant.

The data yielded by this study suggest that topics in the media coverage of nuclear energy are rather negatively aligned. As Figure 20 shows, only in 2010 did the 95 percent confidence interval show an alignment not different from zero, meaning neutral coverage. 2011 is clearly negatively aligned and displays a significantly stronger negative than 2012 and 2014, but not significantly more than 2013 and 2015.

⁵² Because of too-low reliability values for the arguments of the actors, those will not be evaluated or included in this study.

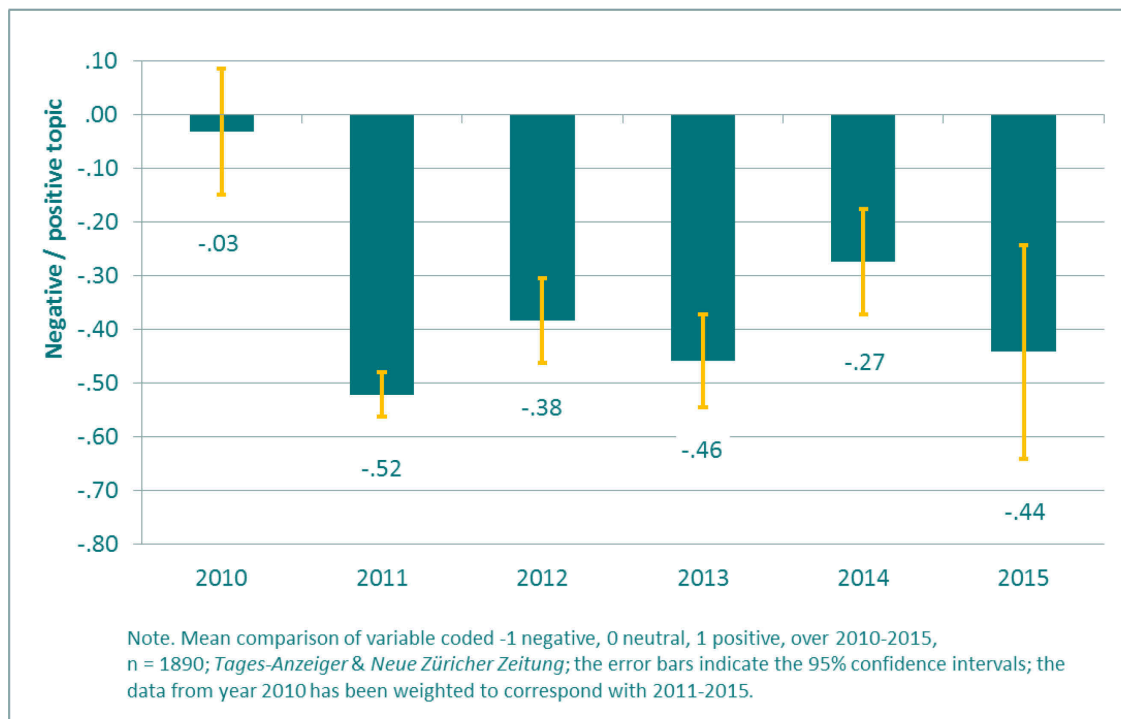


Figure 20 Positive, neutral or negative topic alignment, 2010 to 2015

On the basis of this evidence, it seems fair to suggest that Fukushima triggered media coverage to deal with rather negative aspects of nuclear energy.

9.2.4. Journalistic bias

The section dealing with journalistic bias gathered data on the biases introduced by the individual journalists themselves. This was identified by clear journalistic statements for or against nuclear energy, but also by subliminal expressions: the coders were asked to also read between the lines. An example of a positive biased statement is: “Hardly anyone anymore believes that science has the potential and the skills to solve those problems [nuclear waste problems]. As if only cheaters would deal with the nuclear energy problems – and not intellectual giants” (*Tages-Anzeiger*, 2011j).

The generated data reported in Figure 21 indicate that the journalistic bias was less pronounced than the alignment generated by the discussed topics, as seen in the previous chapter. However, the journalistic bias also has a negative slant. Only in 2010 and 2015 can the coverage be considered neutral, since the mean is not different from zero, looking at the 95 percent confidence intervals. The coverage following Fukushima, however, has a negative bias. The 95 percent confidence intervals indicate that 2011 was significantly more negative than 2010 ($p < .001$), and a one-way independent ANOVA with a

post-hoc Tukey test shows that 2011, 2012 and 2013 were not significantly different from each other; but in 2014, the negativity significantly ($p < .05$) scaled back.

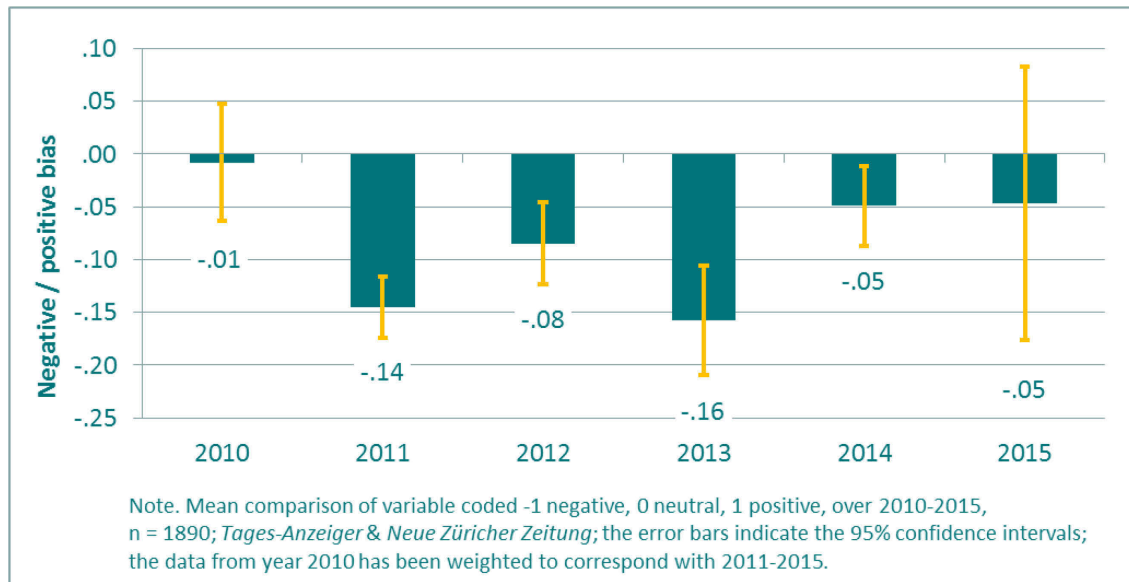


Figure 21 Journalistic bias, 2010 to 2015

These results provide confirmatory evidence that Fukushima triggered journalistic bias to become more negative. This trend lasted for three years, following which the data seem to suggest a return to a less negative slant in 2014. Turning to hypothesis three, these results indicate that the assumptions regarding the bias were only partly true. The coverage was not positive before Fukushima, but neutral. However, as demonstrated in other studies as well (Gamson & Modigliani, 1989; Kepplinger, 1988; Stephens & Edison, 1982), Fukushima triggered negatively biased coverage. In line with Doyle's (2011), this negativity decreased over time; however, in the Swiss case, it decreased rather slowly. Only in 2015 can results vaguely pointing in a neutral direction be seen.

In the case of journalistic choices like the one of bias, or the controversial and sensational coverage discussed in the next two chapters, there are compelling reasons to compare the differences between the newspapers. The general result of that comparison of the coverage from 2010 to 2015 between the papers provides confirmatory evidence that *Tages-Anzeiger* is significantly ($p < .001$) more negatively biased (16%) than *NZZ* (8%). A closer look at the data over the years, in Figure 29, indicates that *TA* journalists wrote significantly more negatively than did *NZZ* journalists in 2011, 2012 and 2015 ($p < .05$).

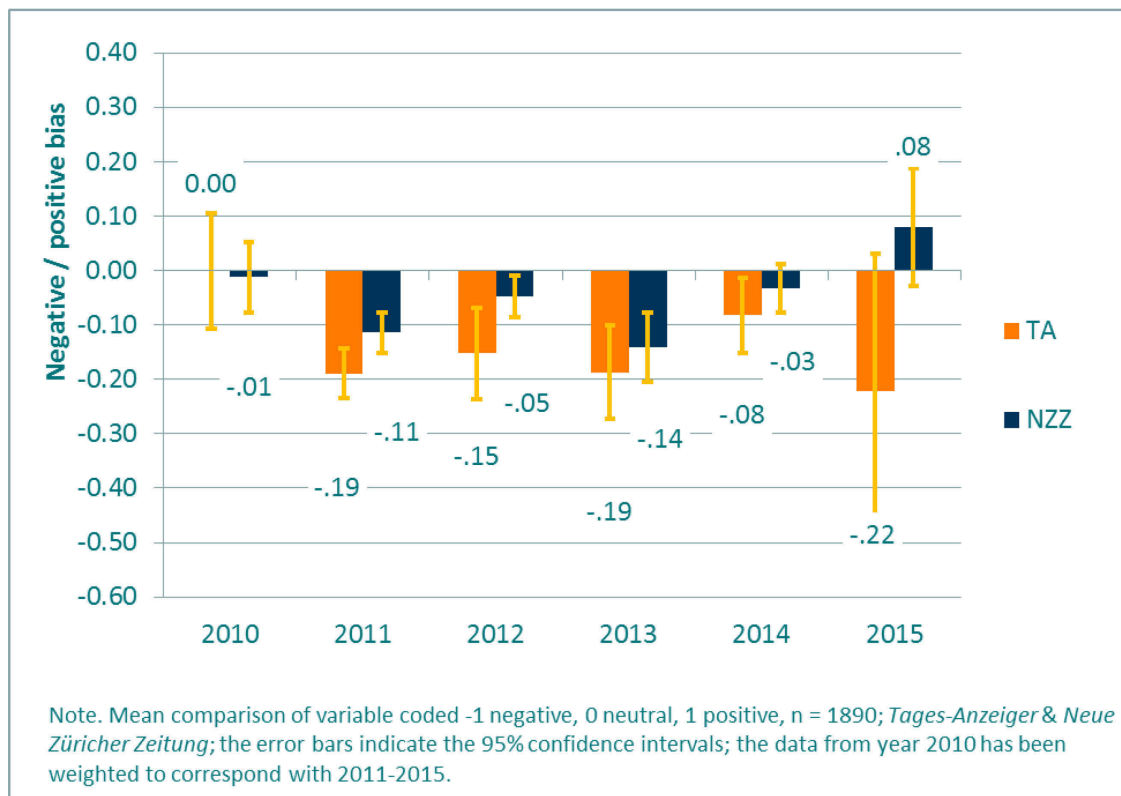


Figure 22 Journalistic bias in TA and NZZ, 2010 to 2015

These results support the general notion that *TA* is more against nuclear energy than *NZZ* is. *NZZ* was, however, also affected by Fukushima and wrote more negatively than before the accident; in 2014, their coverage seemed to be back to the previous pattern, whereas *TA* took a bit more time to return to the neutral coverage it had before the accident.

9.2.5. Controversial news coverage

Along similar lines as those of journalistic bias in media coverage, journalists can also choose to present issues in a controversial way or not. An example of this could be if a journalist were to write: *Even if we phase-out nuclear energy, the problem of nuclear waste is still unsolved*. The data appear to suggest that around every sixth article, across the years, emphasizes the controversy of the nuclear issue, as can be seen in Figure 23.

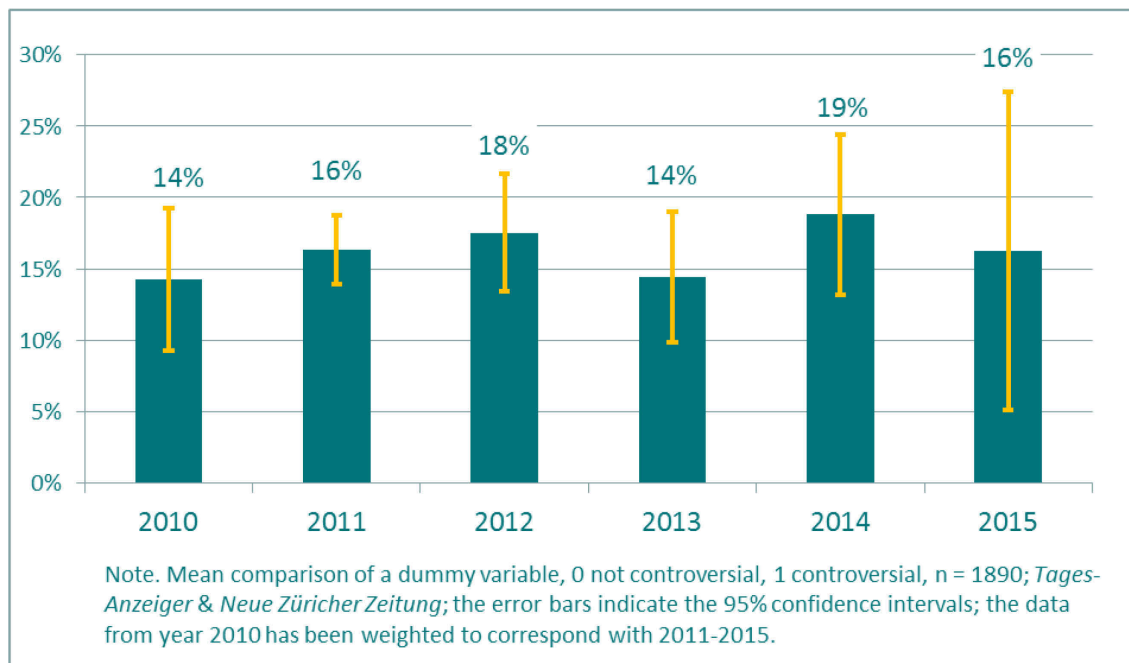


Figure 23 Controversial journalistic presentation, 2010 to 2015

An example of a controversial journalistic presentation is found in the following material from *TA* (2010a) (translated from German to English by the author of this study): “Electricity from gas? There is a deliberate confusion game around the planned gas combined-cycle plant Chavalon in Wallis, a game in which not all are playing with open cards. The following suspicion is in the air: bourgeois pro-nuclear actors want to prevent the planned gas power plant of the electricity group Alpiq, because this plant would delay an electricity shortage and by that, the main argument for a new nuclear power plant might be weakened. [Alpiq wants to build a new nuclear power plant.] In this picture, the recent statements from BKW and Axpo [who also run nuclear power plants and who also want to reinvest in the technology] occur, which say: the electricity shortage will not occur as soon as initially thought. That means, a big gas combined-cycle plant would not be needed so urgently – say the two electricity groups, who are competing for the building licence of a new nuclear power plant. On the other hand, red-green politicians are suspected of wanting to enable the greenhouse gas slinger Chavalon, in order to prevent a new nuclear power plant.” This rather long citation clearly shows not only the controversial situation, but also how the journalist adds to this controversial situation by describing the strategies of the different actors as being sneaky. This is considered to be a journalistic choice. The journalist could have provided the same information in a more neutral way, without for example, the use of expressions like “deliberate confusion game” and “the following suspicion.” However, as the

data show, this journalistic way of presenting controversial situations does not occur very often.

Also, the comparison of the two newspapers in Figure 24 supports the notion of *TA* being more negative than *NZZ* to nuclear energy, as *TA* has a somewhat stronger controversial presentation than *NZZ*. There are, however, no significant differences across the years and there does not seem to be a specific pattern occurring after Fukushima.

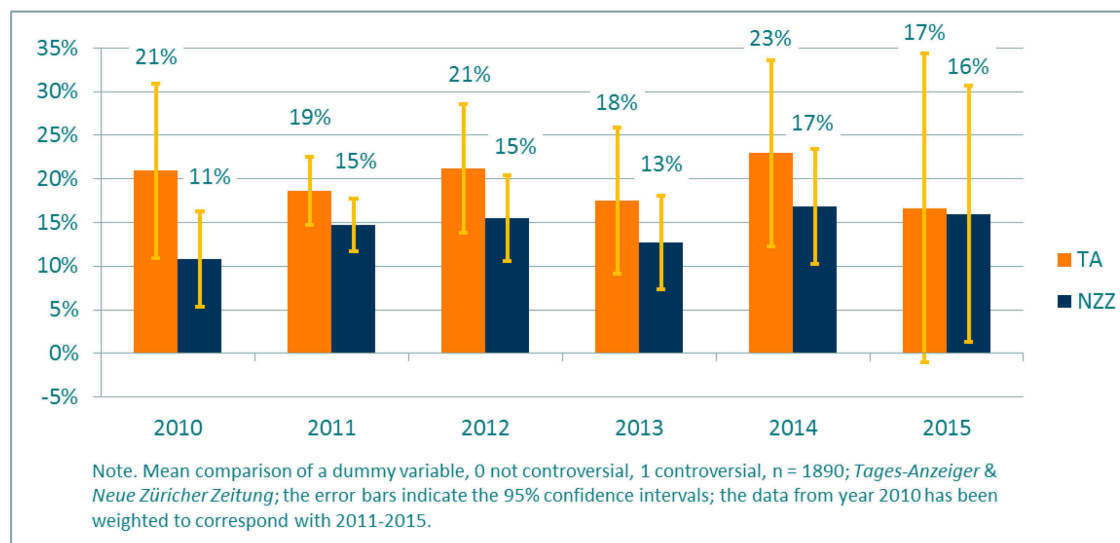


Figure 24 Controversial journalistic presentation in *TA* and *NZZ*, 2010 to 2015

9.2.6. Sensational news coverage

When answering the question of whether journalists report sensationally on nuclear energy or not, statements like “*It is the most fatal nuclear accident since Chernobyl*” would be considered sensational. As Figure 25 shows, six to 16 percent of the coverage overall was sensational. It was significantly less sensational before Fukushima compared to the accident year 2011. In 2012 the amount of sensational coverage was slightly lower than in the accident year. However, it would last until 2014, until the coverage reached a significant ($p < .01$) lower level compared to 2011.

Comparing the two newspapers, the data show that *TA* wrote significantly⁵³ more articles of sensational nature in 2010 than did *NZZ*. In the following years, however, the newspapers wrote sensationally about the same amount. In an article published by *NZZ* (2011c), the journalist writes with sensational language using the following expressions: “the *drama* of the radiation catastrophe,” “*panic-like* selling,” “the *shock* of the inves-

⁵³ T-test independent samples $p < 0.05$.

tors,” “*pale with fear*,” and “the *very depressing* picture” [emphasis mine]. The information the journalist gives in the article could have been covered in a more neutral way, without such loaded expressions; therefore, expressions and statements like those are considered a journalistic choice for presenting the situation in a sensational way.

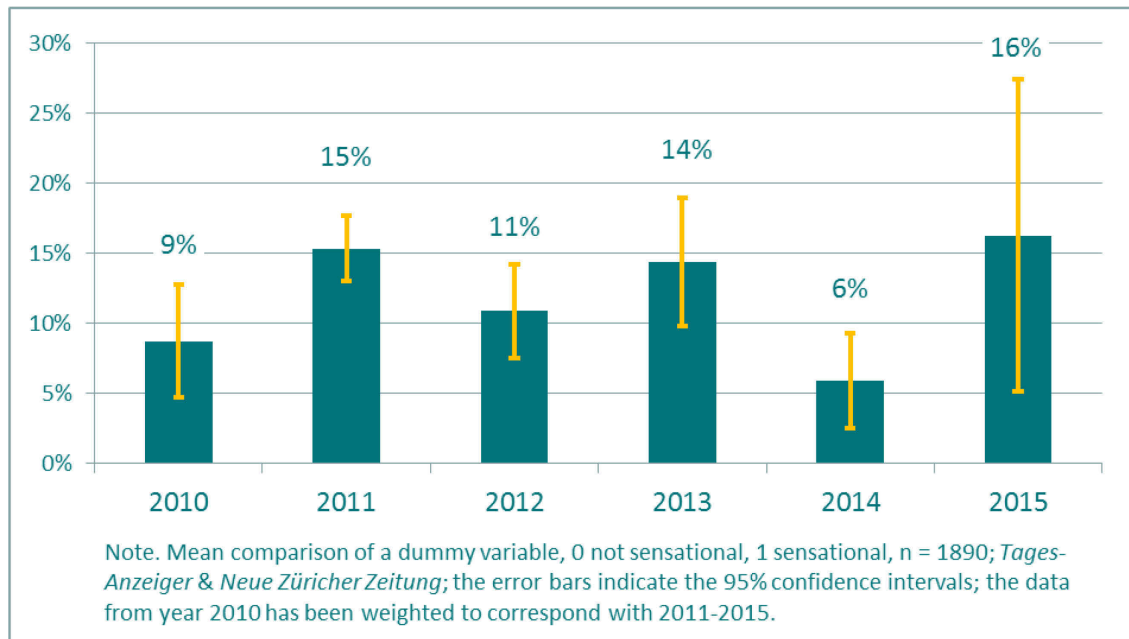


Figure 25 Sensational journalistic presentation, 2010 to 2015

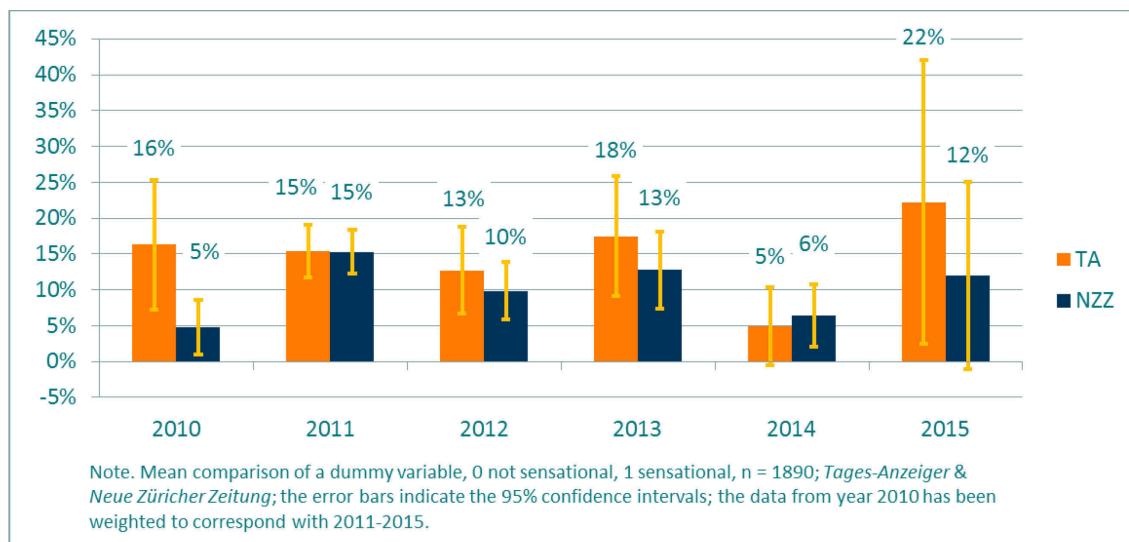


Figure 26 Sensational journalistic presentation in TA and NZZ

9.3. Interim conclusion – nuclear energy coverage before and after Fukushima

In light of the first descriptive results, the first and third research questions shall be discussed.

1. How do Swiss newspapers cover nuclear energy?

3. How is media attention and coverage of nuclear energy different before and after a key event like Fukushima?

To answer the question if and how nuclear energy was covered before Fukushima happened, the results show that it was an issue media covered before the accident. Before Fukushima happened, both newspapers covered the issue each month, and in some months the coverage reached around 50 articles in both newspapers together. Whether this is a high or low number is difficult to say without comparing the amount to another issue. Since there was no month where there were no articles covering the issue, I think the results permit stating that the nuclear issue was on the media agenda before Fukushima happened. In addition to the amount of attention, the issue seems, in general, to be treated as an important one, given the high percentage (77%) of the articles that are written by journalists as compared to the number of news agency articles (20%). However, to be able to say whether this is a high or low number, a comparison with another issue would be needed. With the overall length of articles averaging 430 words (and a fourth of a page being around 350 words), the length also points to the issue being a relevant one. If comparing the newspapers with each other, *TA* published fewer articles, but on average they are longer articles than *NZZ*'s. This result contradicts the study of Saxer et al. (1986), which showed that *TA* published more articles than *NZZ*. This can probably be explained by the sampling strategy of Saxer et al. (1986), as they only sampled articles with Swiss references, whereas this study sampled all articles covering nuclear energy, independent of the country focus. With regard to the formal variables—the number of articles, who wrote them, and how long they were—nuclear energy can be seen as an issue covered by both newspapers before Fukushima.

Going into more detail on *how* the issue was covered before Fukushima, the topics dealt with and actors cited indicate that it was a political economic issue, which is consistent with the results of previous studies (Arlt & Wolling, 2014; Kepplinger, 1988; Saxer et al., 1986). In contrast, however, to older German studies (Buiren, 1980; Kepplinger, 1988), nuclear energy was not negatively biased, but rather treated in a neutral way by the journalists. Arlt & Wolling (2014) had also identified less negativity in Germany shortly before Fukushima, so the results of this study might just mirror this rather

neutral stance to the issue that might have existed before Fukushima. Therefore, hypothesis three is only partly true. The issue was not covered in a pronounced controversial or sensational way, however, *TA*'s coverage was more controversial and sensational than *NZZ*'s. Previous studies have identified controversial media coverage (Buiren, 1980; Gamson & Modigliani, 1989), and since controversial and sensational issues are newsworthier (Schulz, 1982; Staab, 1990) than issues that are not, it does not surprise that even before Fukushima the news coverage showed some measure of this style of journalistic presentation.

Turning to what happened to the news coverage as Fukushima was struck by nuclear meltdowns, it is obvious that the nuclear accident in Fukushima caused coverage to explode. With just over 500 articles in both newspapers together in one month, it is evident that this was an event closely followed by the media. When paging through the print versions of the newspapers after Fukushima, one finds this was an issue present in all parts of the newspaper. It was not only covered on the front page, it was covered in the foreign news section, in domestic news as policy reacted to the issue, in the economic pages, and on the science pages—the issue was omnipresent. This general result supports the common notion that Fukushima was a key event and the data is consistent with results obtained by other studies, like the one by Weiss et al. (2014). Regarding the amount of attention this attracted, it can clearly be considered a key event (Brosius & Eps, 1995; Kepplinger, 2011; Rauchenzauner, 2008; Weiß et al., 2014; Wien & Elmelund-Præstekær, 2009). This result supports hypothesis one. As the analysis of the front pages shows, it can also be considered to have triggered a media storm, since the attention (looking only at the front pages), rose suddenly and by over 150 percent, comprising 20 percent of the front pages in a pattern that lasted for one week (Boydston et al., 2014). This study cannot validate the aspect of multimediality, that is, whether the event was covered in more or less all the big news outlets. It can, however, be assumed that this was the case. It would seem improbable that an issue that prompts nearly 250 articles in one month in one newspaper would be an event that other news outlets could “afford” not to cover. In addition, the triggered attention of communication scholars to analyze media coverage of nuclear energy hints that it was a moment of copious media attention (Cantone et al., 2007; Fretwurst, 2014; Friedman et al., 1987, 1992; Friedman, 2011; Kristiansen & Bonfadelli, 2014; Nienierza, 2014a; Perko, 2012; Rubin, 1987; Schwarz, 2014; Stephens & Edison, 1982; Teichert, 1987; Weiß et al., 2014).

Through Fukushima, the media coverage turned somewhat away from being a rather political economic discussion to accident coverage, also highlighting the risk and safety issues. This confirms that the event was a key event and triggered a media hype, since the attention was directed to the event itself (Kepplinger, 2011; Rauchenzauner, 2008;

Weiß et al., 2014; Wien & Elmelund-Præstekær, 2009). Regarding the actors cited, it focused stronger attention on domestic politicians, away from foreign politicians, which supports the idea of Esser (2011) that politicians might draw more attention in key event situations, as would previous nuclear energy studies (Teichert, 1987). These results go in line with hypothesis two. The way the data regarding actors was collected in this study, however, does not allow for direct confirmation of some key event literature claims: that more actors receive attention after an key event (Brosius & Eps, 1995; Esser, 2011; Vasterman, 2005). The results regarding bias and sensational journalistic presentation do confirm previous results (Friedman et al., 1992; Kepplinger, 1988; Nienierza, 2014a; Stephens & Edison, 1982) that accidents trigger a more negative stance and sensational coverage.

What happened after Fukushima—did the accident change something in media coverage in the long run? After the explosion of media attention of course there had to be a way down again, and the coverage did steadily drop from the close to 500 articles in March 2011, but it took almost one year for the number of articles to reach the level it had been before the accident. Even if the amount of attention did decrease, the seemingly easily peaking issue confirms that the event was a key event and the effect of easily triggered attention seems to be rather long-term. In the half year after the first anniversary, the issue peaks a few times and reaches more attention than it had before Fukushima. Beginning in December 2013, the curve starts to take a similar shape as before Fukushima. But then the political discussion of Switzerland's Energy Strategy 2050 triggers another peak, and after that this study does not deliver any more data. These results are consistent with the theoretical approaches of key events and media hype discussed in chapter 5, which claim that issues will be newsworthier after a key event and similar events will be more likely to catch the attention of the media (Brosius & Eps, 1995; Esser, 2011; Fishman, 1978; Kepplinger, 1988; Kepplinger & Hartung, 1995; Rauchenzauner, 2008; Vasterman, 2005).

What happened topic-wise is that the issue returned to be a mainly politically discussed one, and risk and safety stayed on a higher level than before the accident. This can be put in contrast to the accident of 2011, which, after the accident year, steadily decreased. Interestingly, the Swiss economy experienced a dip after Fukushima. It was one of the fourth most covered topics before the accident and then experienced two years of lower attention, but then caught up again in 2013 and stayed on a higher level than before the accident. A movement in the other direction was experienced by science and technology. It was not receiving much attention before Fukushima, but then gained attention for two years. In sum, one can say that before Fukushima happened, Swiss newspaper coverage was politically orientated, also towards Germany, a country which

was then discussing the issue intensely. Fukushima triggered accident coverage, as can be expected, but it also turned the attention more towards the domestic political situation. Germany, although also turning 180 degrees on the issue—from keeping the technique to phasing it out—was not given as much attention as before the accident. Instead Japanese energy policy was given some attention, but foremost there was an inward orientation toward Switzerland's own policy situation, spiced up with the accident and the risk connected to the technique. This result goes well with the actors speaking, as most of them are Swiss politicians, but many are also nuclear operators. They are, of course, the ones to ask if wanting to have statements from those close to the risk source. And they gained attention after Fukushima. Before the accident, foreign politicians were speaking more than nuclear operators, but after Fukushima this changed and they spoke in more articles than even Swiss politicians did during 2012 and 2013. Somewhat surprisingly, however, scientists and experts are not tapped as often in the assemblage of actors speaking.

One unanticipated finding was that the way journalists present the issue did not simply return to the rather neutral tone used before Fukushima. The covered topics stayed on the negative side and do not show a clear trend towards more neutrality. This is also true for the journalistic bias. However, the negativity of this bias is less distinct and, starting 2014, there might be a trend towards a more neutral coverage. The issue stays more or less on the same level of controversy and sensation, with ups and downs changing slightly each year.

These long-term results seem to indicate that journalistic presentation is rather sensitive to new events happening after Fukushima, and does not just fall back in the old pattern of covering the issue. A possible explanation might be given by the fact that Fukushima was a key event that somewhat changed not only the journalistic contextualization of the issue, but also the coverage in the long-term by making it prone to political changes and discussions as well as more attentive to similar events. The amount of coverage might have returned to levels it had before Fukushima, but the neutral tone of the coverage did not return, at least not in the four years after the accident.

To sum up and give short answers to the research questions one and three:

1. In routine phases, Swiss newspaper coverage puts the nuclear energy issue in a mainly unbiased political context, with politicians and nuclear operators as the most frequent considered actors,
3. but when an severe accident like Fukushima occurs, this leads coverage to a negative focus before it returns to a domestic political context, albeit keeping the rather negative stance for quite some time; somewhat surprisingly, the press continues to

give nuclear operators a similar amount of attention compared to before the accident.

9.4. Risk Analysis

Having seen the general characteristics of Swiss media coverage of nuclear energy in the previous chapters, this part of the study will describe the risk coverage of the two analysed newspapers *Tages-Anzeiger* and *NZZ*. The broad risk definition is fundamental to this study, as it introduces an innovative way to analyse risk coverage. The risk definition enables empirical study, as is argued here, of all aspects or dimensions of risks. As a first step, the following chapters will use simple statistical analyses to show the amount of media attention the different risk dimensions received over the time period analysed by this study⁵⁴. The three main dimensions are decision, benefit, and detriments. The decision dimension can be divided based on which geographical region the decision relates to and also the type of decision: whether to keep nuclear energy, whether to phase-out nuclear energy, as well as upcoming decisions. The analysed benefits and detriments both have three “follow-up” variables, the first of which enables capturing media coverage on the degree to which nuclear energy can be beneficial, or what severity nuclear detriments can have. The second follow-up variable concerns the probability that either benefits or detriments will occur, and the last dimension deals with uncertainty regarding benefits or detriments. The analysis of those dimensions will result in a factor analysis revealing which variables co-occur. The second step of the risk analysis will use the risk dimensions to explore phases in media risk coverage. The phases will be confirmed in a multinomial logistic regression analysis. Following that, the risk dimensions will be used to explore clusters of newspaper articles, which can be seen as using certain “sets” of risk dimensions.

Based on the risk definition presented in this study, this chapter will demonstrate to what degree the two newspapers *Tages-Anzeiger* and *NZZ* discussed the dimensions of this risk definition from the years 2010 to 2015.

Figure 27 demonstrates how often the media reported decisions regarding nuclear energy on average. The bar “decision overall” includes any type of decision (to keep nuclear energy, to phase it out, or future decisions regarding it) in any geographical region; it shows that the media reported a decision in 36 percent of all articles over all the analysed years. If split by geographical region, domestic decisions clearly received the most attention compared to decisions in other countries and Japan.

⁵⁴ See Attachment B for more details.

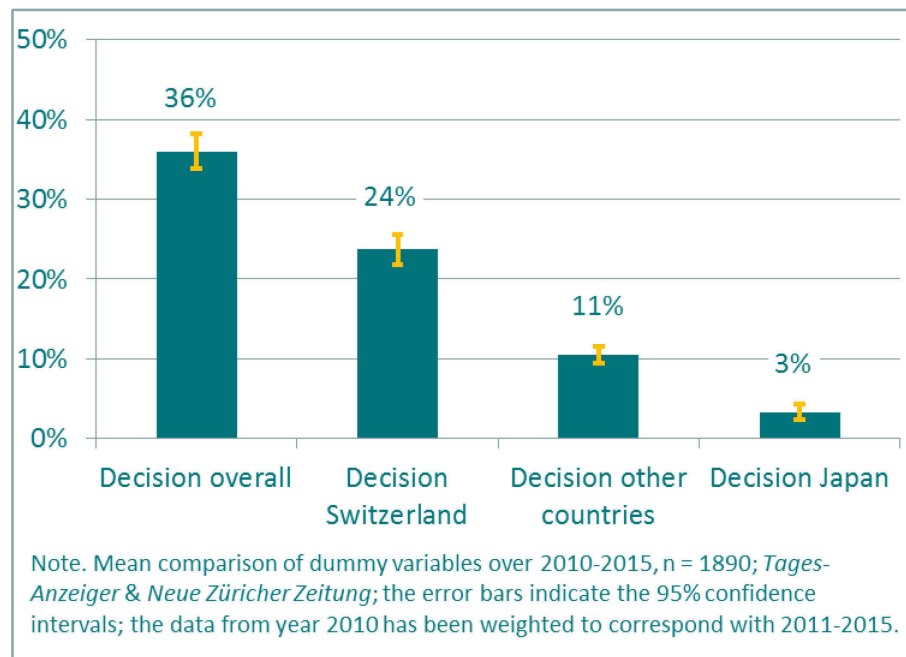


Figure 27 Risk dimension decision and its geographical distribution

Figure 28 presents the risk dimensions benefit and detriment beside each other. The first bar from the left in the figure represents a benefit or a detriment being mentioned, independently of which type of benefit or detriment. The following bars show the average number of times a benefit or detriment's degree or severity was discussed, followed by the probability and the uncertainty communicated in the context. Comparing benefit with the decision and detriment dimensions reveals that benefit was the least reported dimension. In 21 percent of all articles, a benefit was mentioned. In eleven percent, the degree of a benefit was specified; the probability of the benefit occurring was mentioned even more infrequently (2%). Uncertainty regarding benefits was communicated in five percent of all articles. All detriment dimensions were covered significantly more frequently than benefit dimensions. The media reported detriments of any type in almost every second article (49%), significantly more often than the decision dimension. Detriment severity was reported in almost every third article (28%), probability in ten percent of articles, and uncertainty in 22 percent. These results answer that the assumption of hypothesis four also held true in this study, the detrimental side received more attention than the beneficial side of the technology. This result is in line with several previous studies on the German and Swiss cases (Arlt & Wolling, 2014; Fretwurst, 2014; Kepplinger, 1988; Kristiansen & Bonfadelli, 2014).

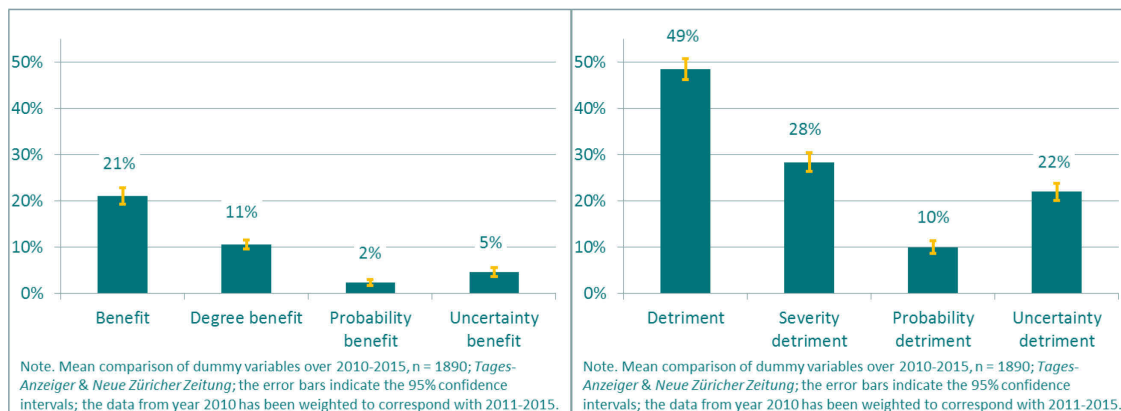


Figure 28 Risk dimensions benefit and detriment

In summary, the results demonstrate that the risk dimension detriment was covered significantly more often than the decision and the benefit dimensions. Even if there was only one accident, it had a very high impact. The decision dimension being reported more often than nuclear energy's benefits might reflect the fact that nuclear energy is such a strongly politicised issue. It can be speculated benefits are mentioned less frequently because they are already well known and are more or less stable over time. To go further behind those questions, however, the three dimensions shall be compared over time.

Figure 29 shows the average attention to all risk dimensions derived from the risk definition over the years, coded as dummy variables. The first thing to observe is that decisions connected to nuclear energy (to keep nuclear energy, to phase it out, or future decisions) and detriments are the two risk dimensions that are the most reported every year except 2015.

An interesting result to note is the average amount of attention detriments received in 2010, when detriments were reported upon in 34 percent of all articles. Benefits received a similarly high amount of attention, as they were reported in 32 percent of all articles. Observing this information and the fact that decisions were most reported of all risk dimensions (44%), 2010 could be called a "discursive moment". A similar pattern is observable in 2014, when there was also no significant difference in the amount of attention paid to decisions and benefits and only a small difference between benefits and detriments.

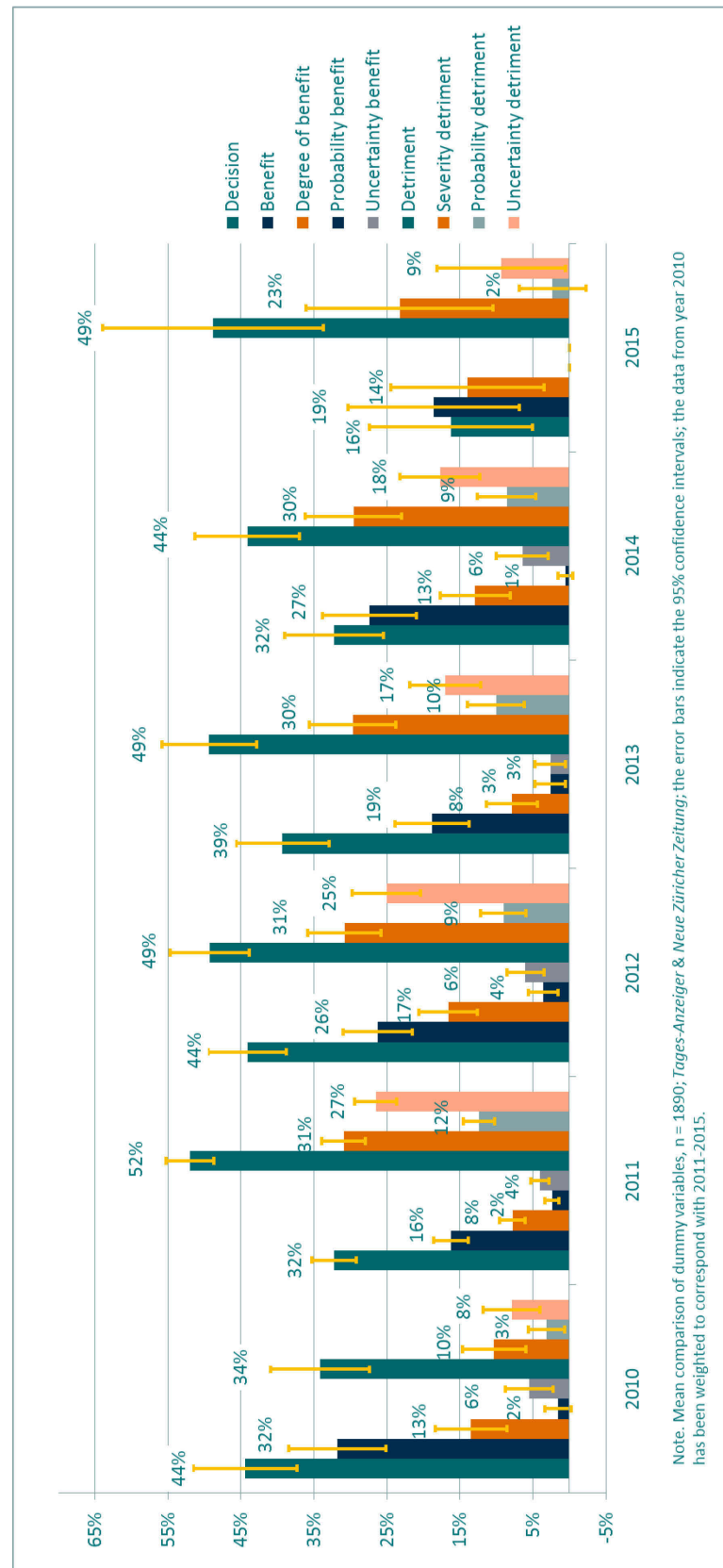


Figure 29 All risk dimensions, 2010 to 2015

The single least frequently reported dimension is the probability of a benefit occurring. Across all years, it was reported in only two percent of all articles ($SE = 0.003$). Whether this is a result of the media being poorly equipped to deal with the benefit probability, or there is little data to report on, or it just not being of interest or even being taken for granted, can only be speculated upon. The probability of detriments was the next less frequently reported dimension, appearing in ten percent of all articles over all years ($SE = 0.007$). It can be speculated that the probability of a detriment happening would be of quite high interest especially after Fukushima, which is reflected in Figure 29 as there was a significant rise in coverage in 2011 compared to 2010. However, this dimension might not be so easy to report upon, perhaps due to a lack of verified data. The degree of the benefits ($M = 0.11$, $SE = 0.007$) was also reported relatively infrequently over the years. There was a significant rise in attention to this variable in 2012 compared to both 2011 and 2013. Note that the “following variables” (i.e. degree of benefit, probability of benefit, severity of detriment, and probability of detriment) can by the nature of the coding never reach numbers higher than the “main variables” to which they are connected (i.e. benefit and detriment), as the “follow-up variables” were coded only if first a benefit or detriment was mentioned. In Figure 29, however they are comparable with each other, since all variables were coded as dummies independent of the number benefits or detriments or how many times a probability were mentioned, for example.

In the following chapters, the risk dimensions shall be discussed separately in order to get a more detailed overview, and also go into detail about the different types of dimensions that have been measured.

9.4.1. *Risk Dimension Decision*

To capture whether a decision regarding nuclear energy was discussed in the newspaper, three variables measuring decision in Switzerland, Japan and elsewhere were operationalized. Each measured one of three different types of decisions, respectively:

- Decision to phase-out nuclear energy
- Decision to keep nuclear energy
- Upcoming decisions (i.e. future referenda)

As derived from theoretical considerations, decision is a central dimension of risk. Risks are taken by a decision; it is therefore of interest to explore whether the media cover this aspect. Combining all three types of decisions (phasing out nuclear energy, keeping it, and upcoming decisions) as well as the three differentiated regional types (Switzerland, Japan and elsewhere) in one dummy variable, the results show that the dimension decision was discussed on average in 36 percent ($M = 0.36$, $SE = 0.011$) of

all articles over the whole time span analysed. On average, any decision in any country was more frequently reported before Fukushima ($M = 0.46$, $SE = 0.03$) than after the accident ($M = 0.35$, $SE = 0.01$). This difference, 0.11, was significant ($t(1888) = 3.31$, $p = 0.001$).⁵⁵ If the means over the years are compared, this result is relativized. The error bars in Figure 30 that indicate the 95% confidence intervals and the results of a one-way independent ANOVA with the Tukey post hoc test reveal that there are significant ($p < .05$) differences between 2011 and 2010 and 2012. Clearly there was less media coverage of decisions regarding nuclear energy in the accident year than in the years immediately before and after. Other than that, the decision dimension was also reported significantly ($p < .05$) less in 2015 than in 2010, 2012, and 2013.

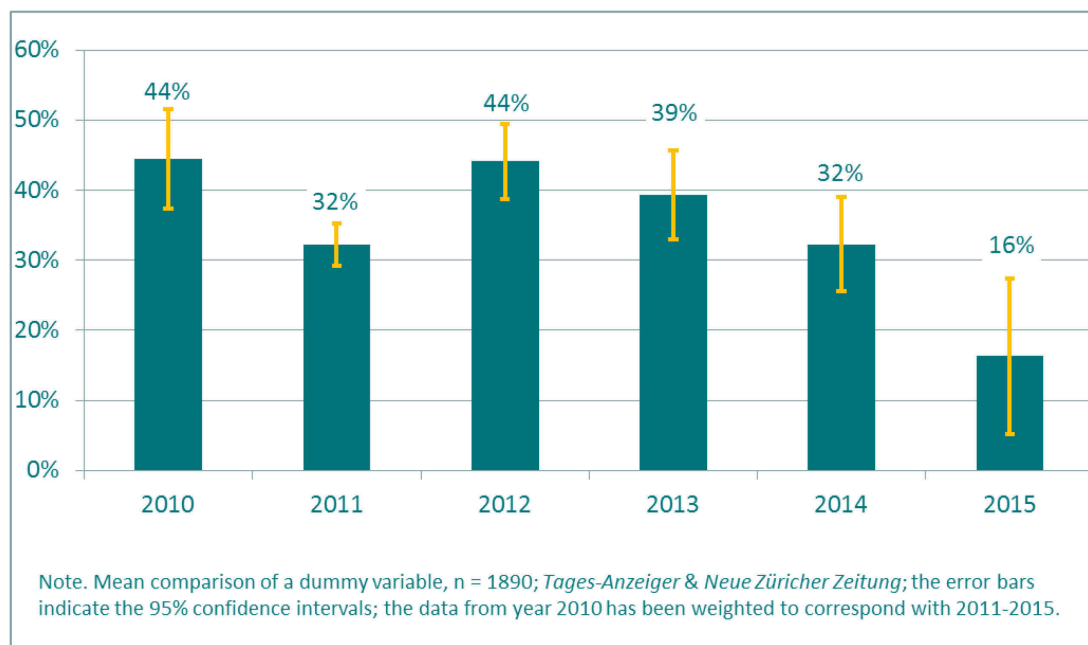


Figure 30 Any decision regarding nuclear energy, in any country, 2010 to 2015

Turning to which decision of which geographical area was most covered, and splitting the decision dimension to decisions in Switzerland, Japan, and any other country, the Swiss decisions were on average significantly ($p < .05$) the most frequently mentioned, as can be seen in Figure 31. Decisions in countries other than Switzerland or Japan were on average significantly more often covered than decisions regarding Japanese nuclear energy.

⁵⁵ Independent t-test.

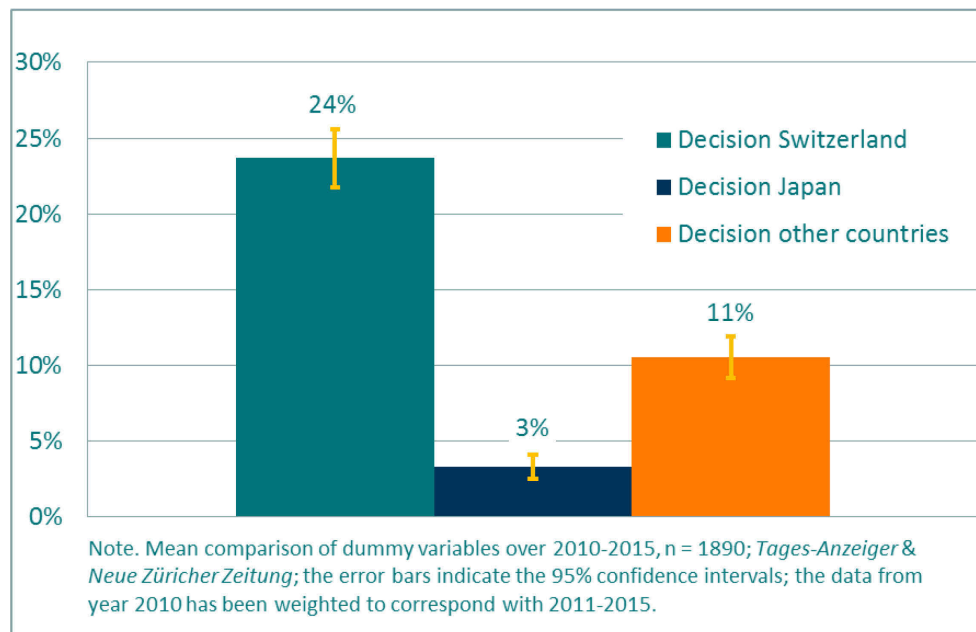


Figure 31 Comparison of the risk dimension decision between geographical regions

As can be seen in Figure 32, there was no significant⁵⁶ difference in the frequency with which Swiss decisions were covered across all years. The mean does differ slightly, but never significantly. Therefore, the media coverage of Swiss nuclear energy decisions was stable over the entire time period and was covered on average in 24 percent of all articles ($M = 0.24$, $SE = 0.009$). The media coverage of Japanese decisions however, did differ over the years. Generally it remained at a low level, but in 2012, the Japanese decisions were significantly more often covered than in all the other years. It does not reach a higher level of coverage than that of decisions elsewhere. The decisions elsewhere, however, were significantly more often covered in 2010 than in all the following years, and then at the same level as domestic decisions. This changed in 2011, however, when coverage of Swiss decisions regarding nuclear energy stayed at a similar level but that of decisions elsewhere significantly dropped. This pattern held until 2014 and might have changed in 2015. Because of the much smaller sample derived for 2015, no secure statements can be said about that year. The result for 2010 is an interesting one. Other countries' decisions were discussed as frequently as domestic nuclear energy-related decisions. This might have to do with the nuclear energy discussion going on in Germany at that time.

⁵⁶ Discussions of significant differences, without mentioning a t-test or an one-way independent ANOVA with Tukey post hoc test, refer to the confidence interval error bars and the significant different always relies on $p < .05$.

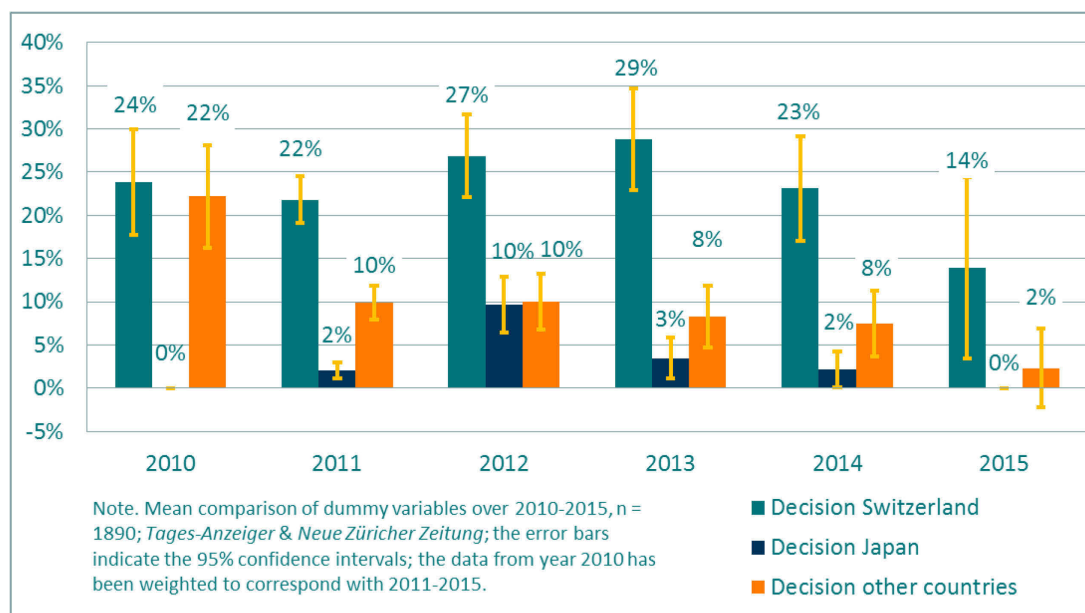


Figure 32 Comparison of the risk dimension decision between geographical regions, 2010 to 2015

The low level of coverage of Japanese decisions in 2011 is initially surprising, but might have to do with the fact that the country had other more urgent problems to address and only in 2012 were able to turn to how and whether to decide differently on nuclear energy.

A few results shall be pointed out in Figure 33, where decision is split according to whether the decision regards a nuclear phase-out, keeping nuclear energy, or a future decision as well as by geographical region. In 2010, future Swiss decisions were discussed significantly more frequently than other decisions regarding nuclear energy. In the same year, foreign countries' decisions to keep nuclear energy were also prominently covered by Swiss newspapers. Plausible explanations for these results are the referendum held in Bern in February 2011 and the discussion leading up to that about the Swiss building plans, as well as the on-going German debate over keeping nuclear energy. Looking at the coverage of Swiss decisions in 2011, that of phase-out decisions significantly rose compared to 2010 and rose even more in 2012 to then slowly climb down the attention ladder, though the changes were not statistically significant, and this category remained the most discussed one until 2013. In 2014, coverage of phase-out decisions and future decisions were not significantly different from each other.

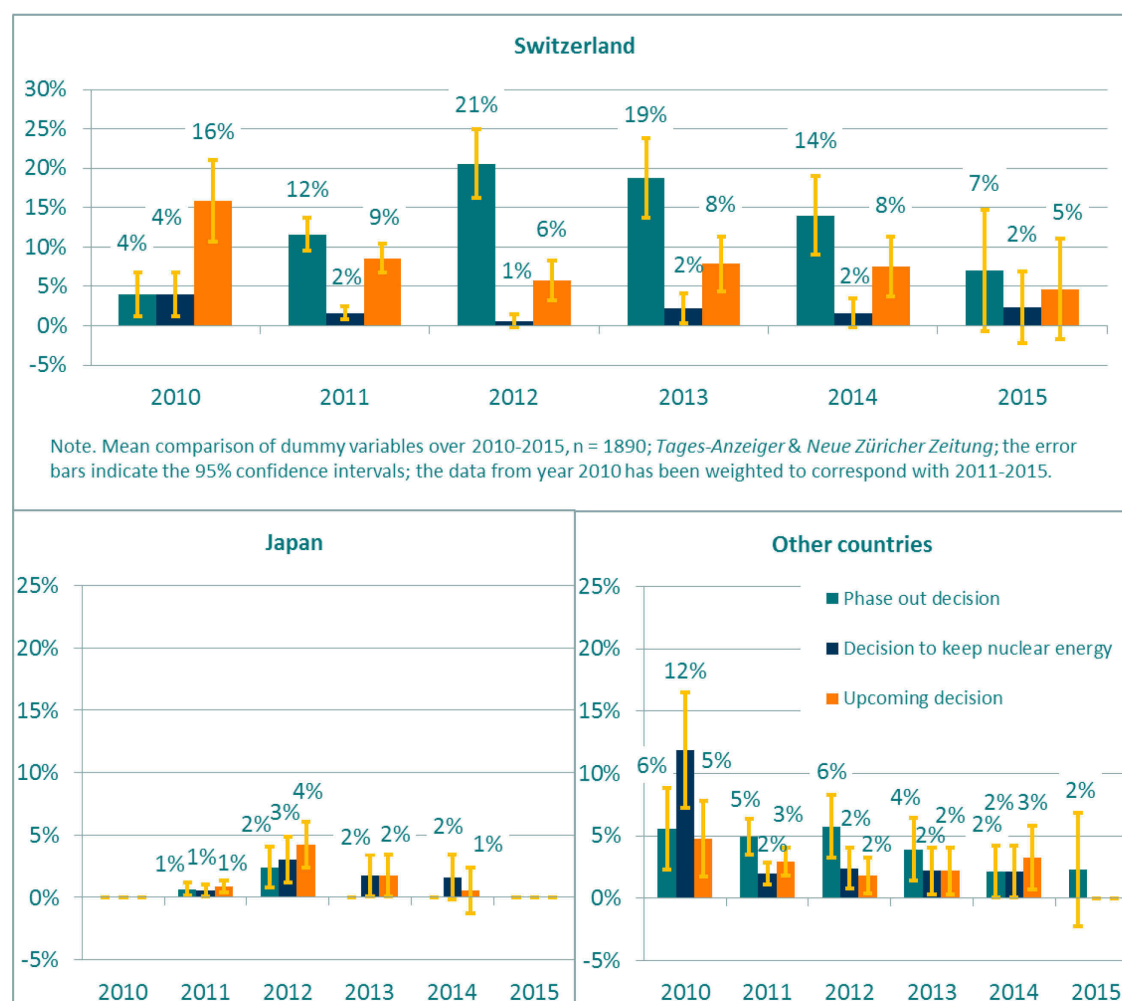


Figure 33 Comparison of type of decision split by geographical region, 2010 to 2015

To sum up, the first observation is that decisions on how to address nuclear energy in any country, whether to keep it or whether to phase-out, were reported upon in 36 per cent of all articles over the sample's entire time frame. Overall, Swiss decisions were given more attention in the two Swiss newspapers and were discussed in 24 percent of all articles analysed in this study. In 2010, however, as much attention was given to the Swiss context (24%) as to decisions in other countries (22%), as those numbers are not significantly different from each other. Articles focusing on Swiss decisions about upcoming nuclear energy decisions were most frequent (16%). In coverage of other countries, there was a heavier focus upon decisions to keep nuclear energy (12%), which however was not significantly higher than the focus on decisions to phase-out nuclear energy (6%). In 2011 and the following years, domestic decisions were significantly more focused upon. In 2011, nuclear phase-out decisions (12%) and upcoming decisions (9%) were in focus. Nuclear phase-out decisions in Switzerland were significantly more reported by the media in 2012 (21%) and 2013 (19%) than were the other two

decision categories. This strong focus steadily decreased over the years, however, and was no longer reported significantly more frequently in 2014 (14%) in comparison to upcoming decisions (8%). Japanese decisions were not given much attention overall (3%), but were given the most media attention in 2012, with a slight focus on upcoming decisions (4%).

9.4.2. Risk Dimension Benefit

In general over the whole time studied, any of the nine measured nuclear energy benefits were reported upon in 21 percent of the articles ($M = 0.21$, $SE = 0.009$). The frequency of attention paid to different benefits differed over the years, as can be seen in Figure 34. On average, the media paid the most attention to nuclear benefits in 2010, when a benefit was mentioned in 32 percent of the articles. This is a significantly higher amount of attention than in 2011 and 2013. On the other hand, the mean of 2011 is lower than 2012 and 2014.

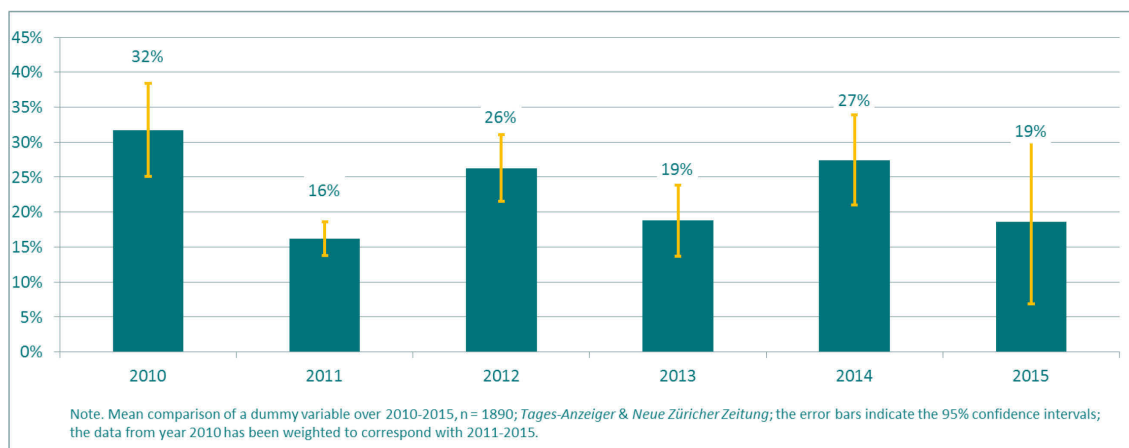


Figure 34 Nuclear energy benefits, 2010 to 2015

As can be seen in Figure 35, the most frequently reported benefits of nuclear power plants are general energy production (7%), the cheap energy they produce (7%), and the energy supply safety they provide (5%).

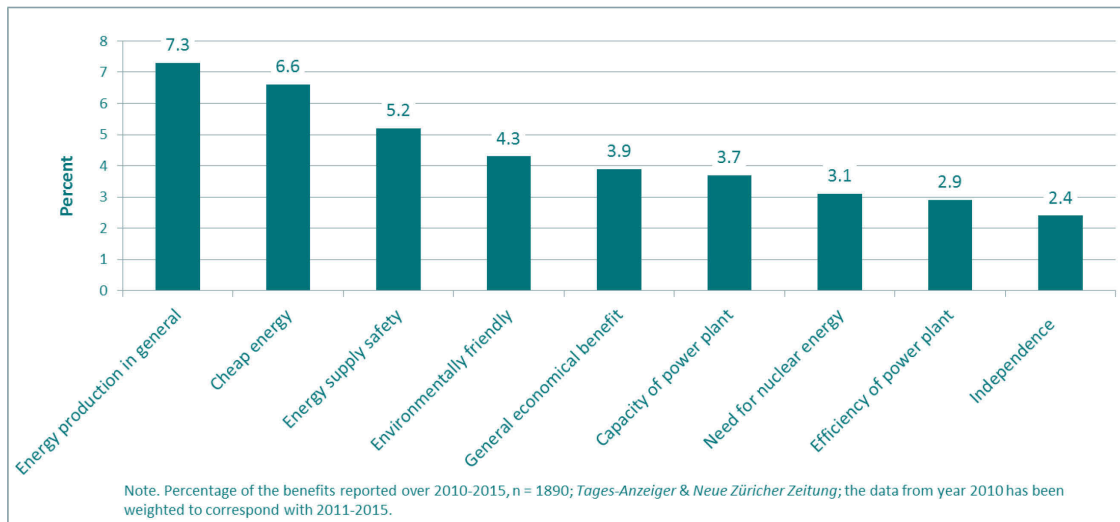


Figure 35 Type of benefit reported on over 2010 to 2015

All benefits were coded whether they were potential future benefits, they were actual and already occurring benefits, or they were mentioned as both. This can be seen in Figure 36, which shows which types of benefits were reported upon. The first thing to observe is that general benefits are mostly reported upon if they are actually occurring (23%). Discussion of potential (9%) and both potential and actual (8%) benefits was less present in the media coverage.⁵⁷ Beyond that, the labelled bars are the types of benefits most discussed by the media. The actual benefit of having cheap energy was discussed in almost five percent of the coverage. The actual benefits of energy production in general, energy supply safety, the capacity of power plants, and their environmental friendliness were all discussed in almost three percent of the articles.

⁵⁷ The total percentage of the types of benefits reported upon can be higher than that of the general discussion of any benefit. This is caused by the fact that more than one benefit could be coded in the articles.

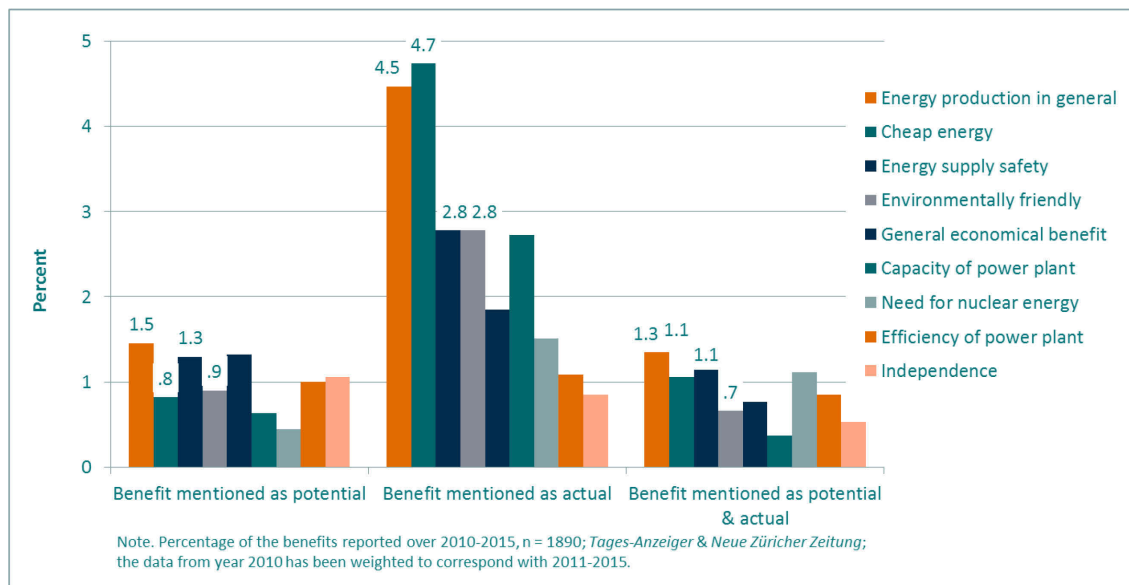


Figure 36 Percentage of benefits reported on over 2010 to 2015

The next question, when those types of benefits were most reported, is illustrated in Figure 37. In this figure, only the four most commonly reported benefits are visualised in order to provide a better overview. Since there are few significant differences in benefits to point out between the years, some general results shall be mentioned. In 2010 13 percent of all articles mentioned the benefit of cheap energy. This was the only year in which the focus upon this benefit was so strong. In 2012, focus shifted to the benefit of energy production in general (12%). In both years, however, the means between those types of benefits do not differ significantly from each other. As there are almost no significant differences to be pointed out, it can be concluded that those four most discussed benefits are more or less equally important in the discussion of nuclear energy benefits. Thus this way of producing energy is presented by the media as a good source for energy very generally speaking, as it is seen as a cheap and stable method of energy production, which comes with the benefit of being environmentally friendly.

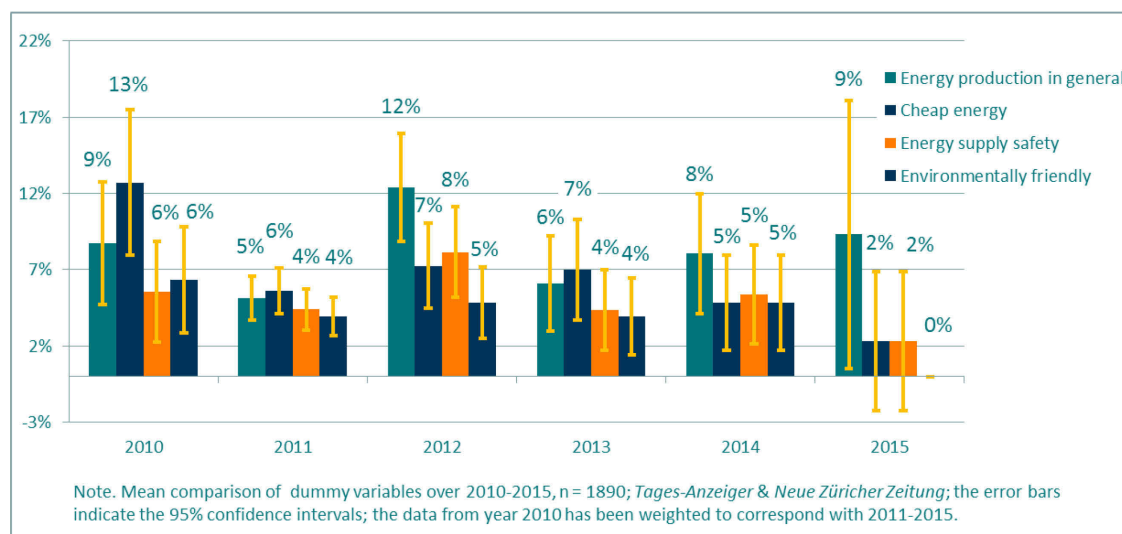


Figure 37 The most reported benefits, 2010 to 2015

The nine coded benefits can be combined into more general groups, based on the four categories shown in chapter 2: technical (capacity of power plant, efficiency of power plant), economical (general economical benefit), societal (energy production in general, cheap energy, energy supply safety, need for nuclear energy, independence) and environmental (environmentally friendly)⁵⁸. The societal benefits were mentioned most frequently of those four categories, as they were present in 16 percent of all articles in the sample. Technical benefits were covered in six percent, and environmental and economical benefits were covered each in 4 percent of all articles. Figure 38 shows the percentage of those benefit categories' coverage over the years. Obviously, societal benefits were covered significantly more frequently than other categories in all years except 2014 and 2015. Technical benefits were covered the most in 2012, 2014 and 2015, but only in 2011 the technical benefits were covered significantly less than in the other years. The large confidence interval in 2015, due to the small number of articles coded from this time, does not allow an interpretation. The economical and environmental benefits are not covered significantly more or less in any of the years.

⁵⁸ The fifth category, "individual" benefits, has been omitted. During the phase in which the media coverage was explored and the codebook developed, it showed that the individual benefits, like job creation, did not play a big role in the Swiss media coverage.

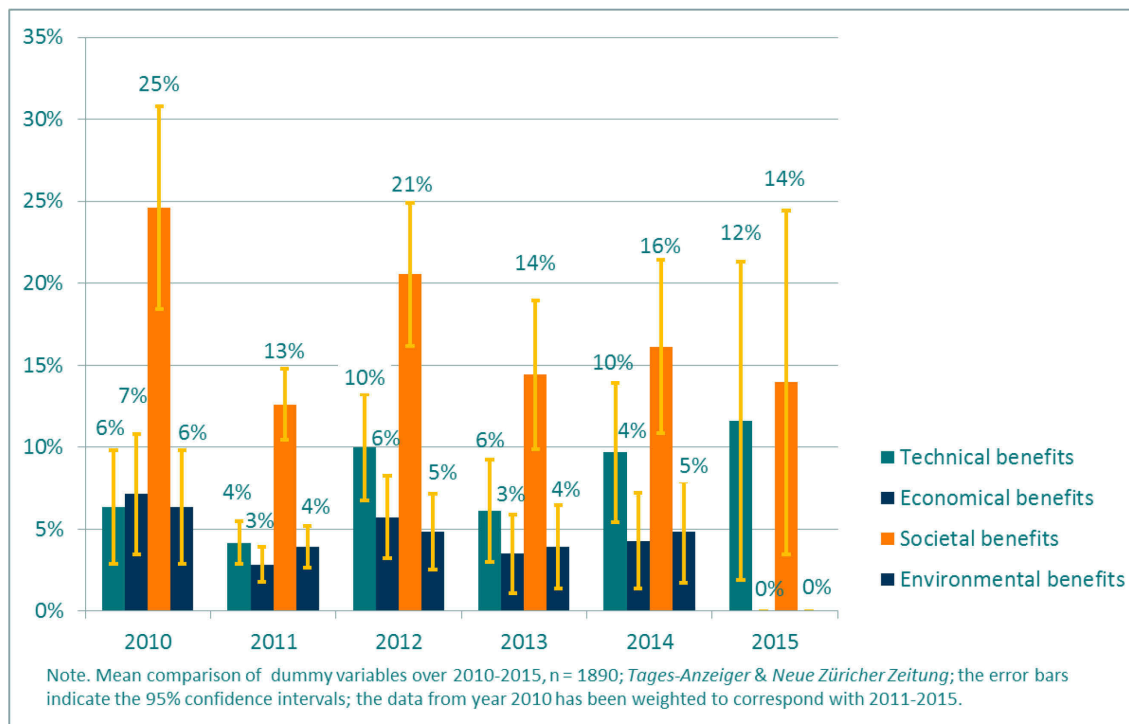


Figure 38 Benefit categories, 2010 to 2015

9.4.3. Risk Dimension Benefit Degree

The variable measuring the discussed degree that different benefits can have is the “follow-up” variable connected to benefits that occurs the most, compared to the probability of a benefit occurring or the uncertainty connected to it. Overall, the degrees of benefits appear in eleven percent of the coverage in the sample period. Figure 39 shows the distribution the risk dimension takes across the years.

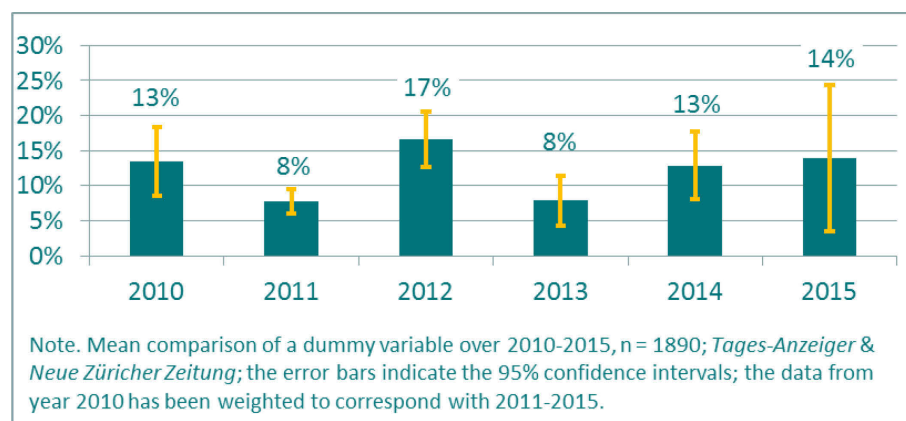


Figure 39 Degree of benefit, 2010 to 2015

Significant differences in the amount of coverage of the degrees of benefits occur only between 2011 and 2012, as the media covered the degree of benefits significantly more frequently in 2012 compared to the accident year. From 2012 to 2013, attention paid to this risk dimension decreased significantly. 2012 was not significantly different from 2010, 2014, or 2015, but between 2011 and 2013 it was an exceptional year. 2012 was a year in which the societal benefits were mainly discussed. This result might indicate a reconsideration of nuclear energy production's benefits for society when discussing the decision of a nuclear phase-out.

9.4.4. Risk Dimension Benefit Probability

The risk dimension benefit probability is the follow-up variable of benefits that is least frequently covered by the media. Overall it is mentioned in only two percent of the coverage. Since there is almost no discussion of this issue, it might be interpreted as self-evident that the benefits will occur and that there is no high or low probability that needs to be discussed. This might well be true and also say something about risks—if the benefits of a risk have a low probability and would be an issue of discussion, such a risk might not be considered at all in the first place. This is speculation and would have to be empirically proven, but it does seem logical as the data show that the probability of nuclear energy benefits are almost completely undiscussed by the two Swiss newspapers. As Figure 40 shows, the probability of benefits were most frequently discussed in 2012. However, there are no significant differences to be seen across the years⁵⁹.

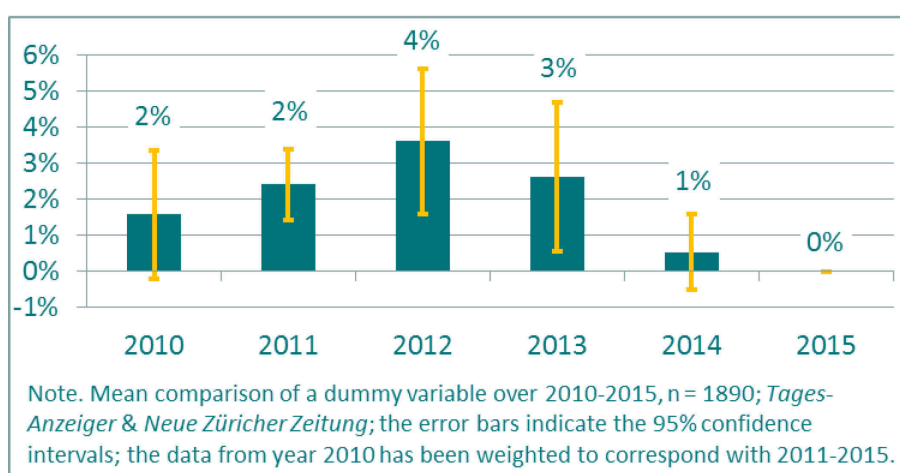


Figure 40 Benefit probability, 2010 to 2015

⁵⁹ This was verified by a one-way independent ANOVA with post-hoc Tukey test, as the coefficient intervals might indicate a significant decrease from 2012 to 2014. This was not the case, however.

9.4.5. Risk Dimension Benefit Uncertainty

The media infrequently covered the uncertainty of the benefits of nuclear energy media over the researched time period. Uncertainty was mentioned in five percent of all articles across the sample period. Figure 41 shows how often uncertainty was covered in each year during the sample period.

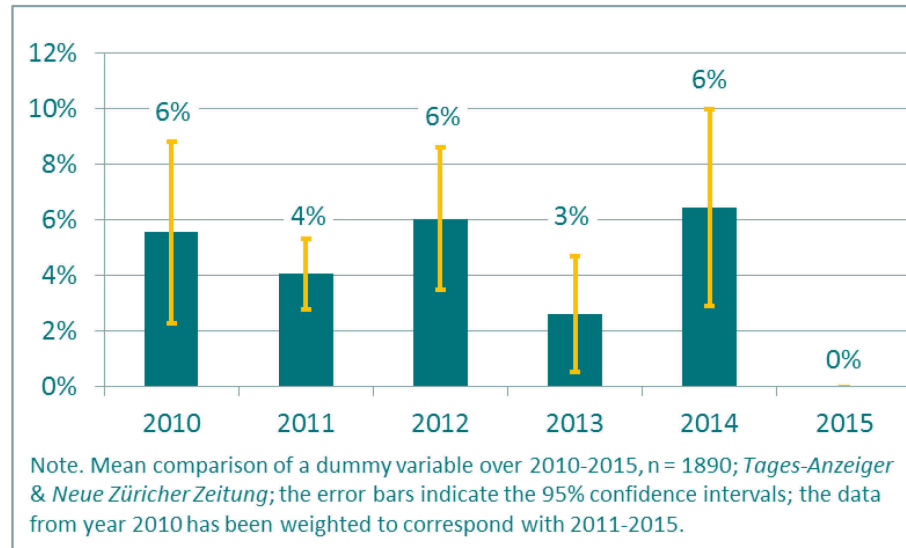


Figure 41 Benefit uncertainty, 2010 to 2015

Ignoring 2015, where the analysed number of articles is very low, there are no significant differences in the amount of benefit uncertainty coverage. As with probability, the uncertainty connected to benefits can be expected to be causing such little media coverage, as the benefits might not be very uncertain. It seems probable to assume that the benefits from risks are relatively certain, as it would otherwise not make much sense to engage in the specific risk taking.

9.4.6. Risk Dimension Detriment

The risk dimension detriment received a similar level of media attention in 2010 as benefit did on average. In 2011, however, this changed, and detriments were mentioned in every second newspaper article, as can be seen in Figure 42. This change was statistically significant and the attention to detriments remained at a significant higher level until 2013. In 2014, there was still a higher amount of media attention to this dimension, but it is no longer significantly different from the period before Fukushima. Clearly Fukushima triggered higher media attention on nuclear energy's potential detriments, and this pattern held for at least three years.

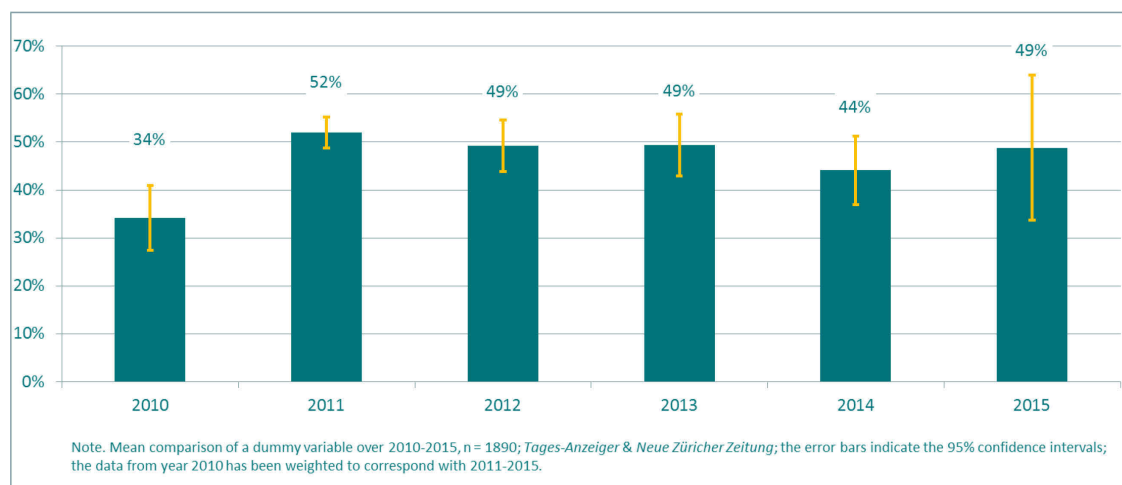


Figure 42 Nuclear energy detriments, 2010 to 2015

The next question is which types of detriments were focused upon. The analysis allowed for 21 different detriments to be coded. As can be seen in Figure 43, the amount of attention paid to the different types of detriments varied. The two types that were clearly reported the most are the ionizing radiation and the detriments to the nuclear power plant. These detriments can be directly connected to the accident in Fukushima, since there were no other major accidents in this time period. The ionizing radiation, however, can also be connected to the radiation found in the Swiss lake *Bielensee* in the summer of 2013, for example. After those two most reported detriments, the following 19 slowly decrease. The next detriments—those to the economy in general and to the environment—could more or less be seen as connected to the Fukushima accident as well. However, the nuclear waste was not necessarily reported on in the context of the accident.

As can be seen in Figure 44, the attention paid to different detriment states, potential and actual, varied. Across all detriments, actual detriments were reported upon the most. In 64 percent of all cases, the detriments reported on had already occurred. In 37 percent, they were covered as potential detriments, and in 22 percent of all cases, they were reported as both potential and actual. Thereby the pattern for the detriment state is the same as the one for benefits, with actual benefits and detriments being covered most frequently. The four most commonly covered detriments have been labelled in Figure 44 to enable a better overview. Each of the four detriments was covered more frequently when actual compared to being discussed as potential detriments.

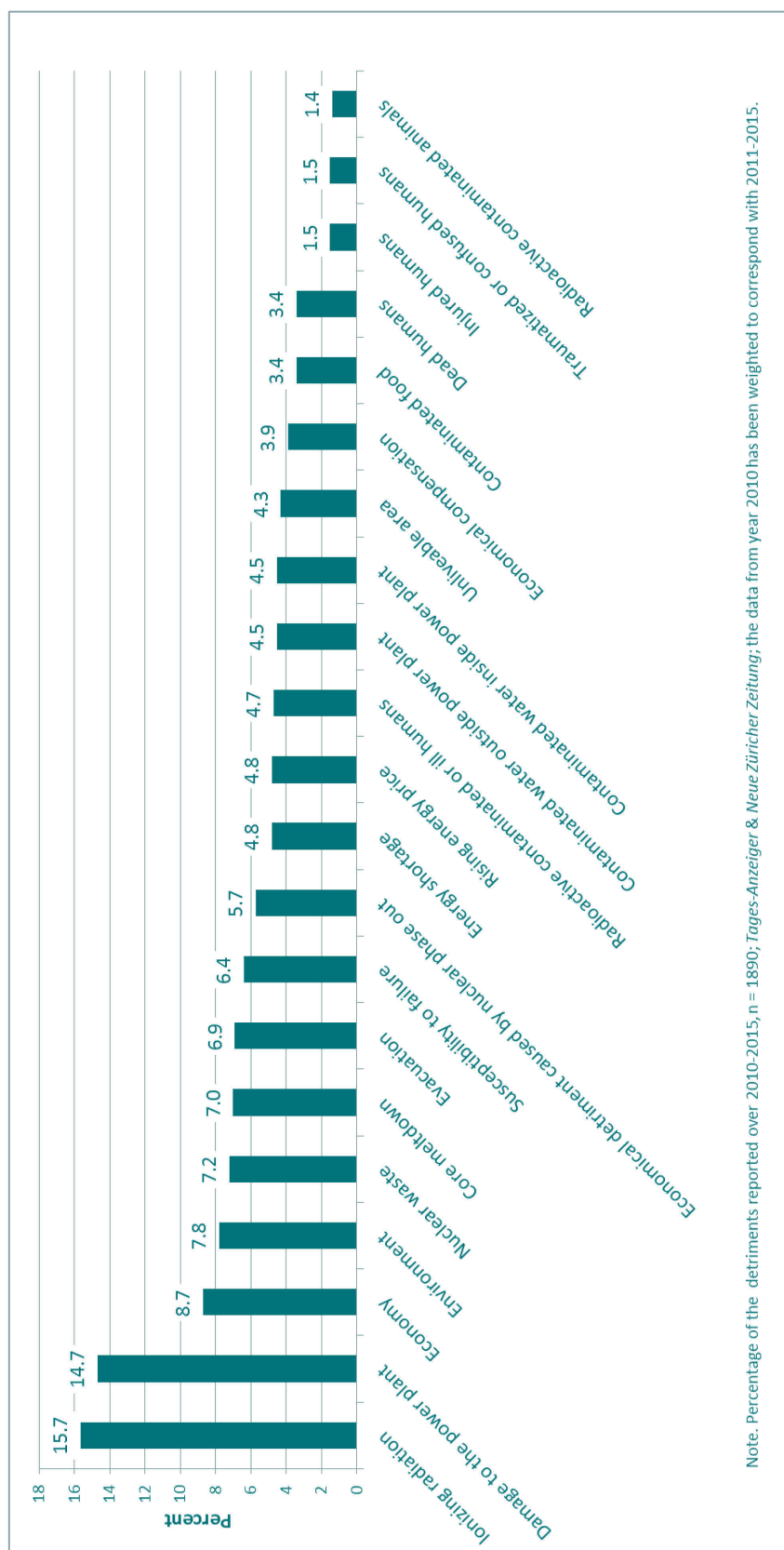


Figure 43 Types of detriments reported on 2010 to 2015

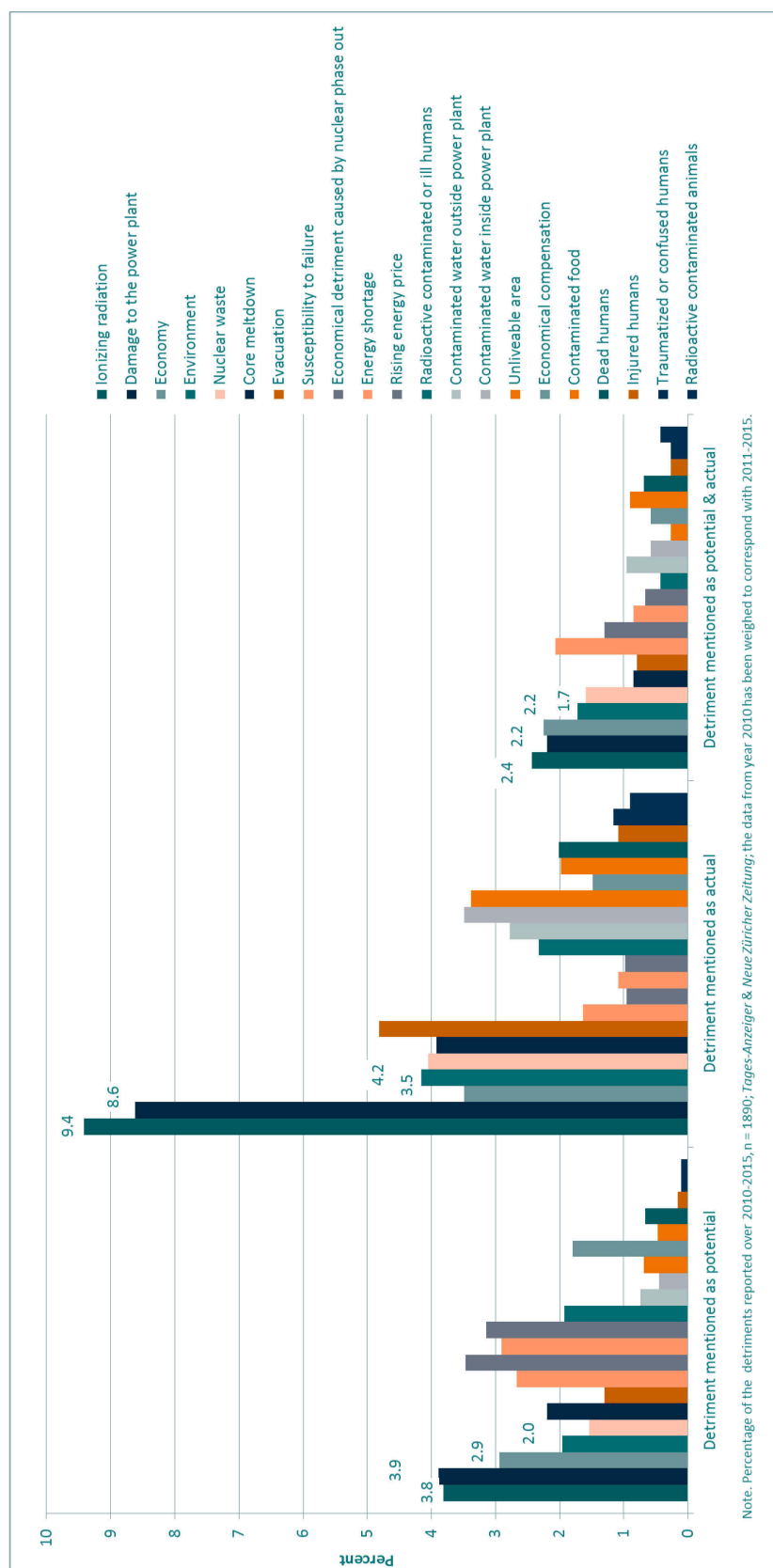


Figure 44 Percentage of detriments reported on from 2010 to 2015

Figure 45 shows how the four most commonly reported detriments have been covered across the years. Before Fukushima, ionizing radiation was significantly more reported than only detriments to the economy. Of course, ionizing radiation reporting rose significantly in 2011 compared to the year before and was covered in 22 percent of all articles. The damages to nuclear power plants also rose significantly in media attention and were reported in 18 percent of all articles. Those two detriments were given significantly more media attention than detriments to the economy and the environment. This pattern changed in 2012, as the ionizing radiation lost attention significantly compared to the year before. It even returned to a similar level as before Fukushima, and it stayed at that level for the following years. The media attention to economical detriments rose significantly compared to 2011. Together with the detriments to the nuclear power plant, it was the most covered detriment in 2012. Interestingly, damages to the nuclear power plants stayed at a quite stable level across the years following the accident. The economical detriments lost some interest in 2013 and stayed on a stable level after that.

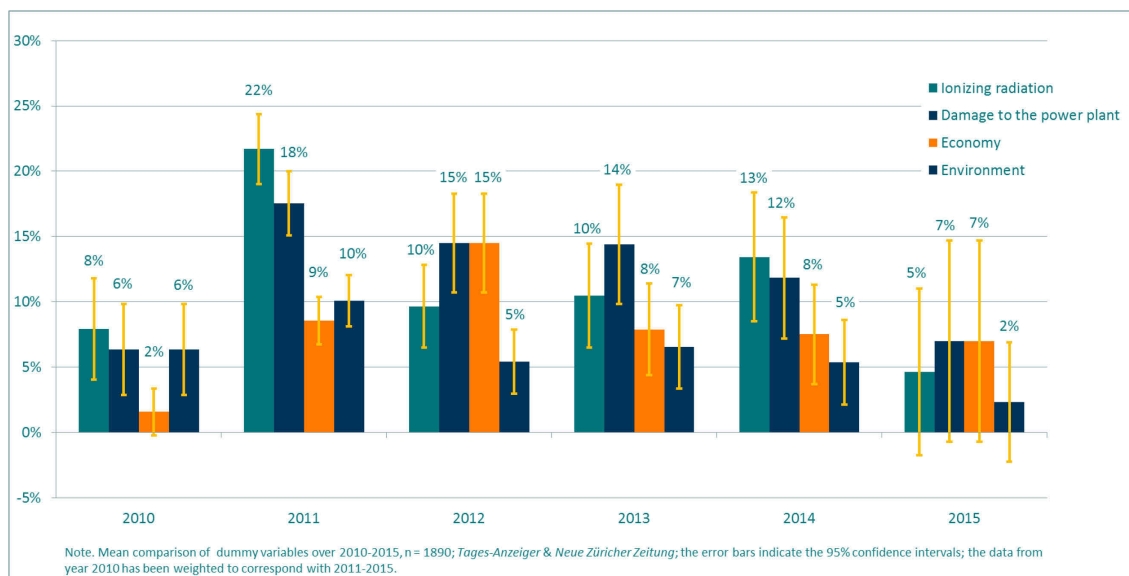


Figure 45 The most reported detriments, 2010 to 2015

In summary, it can be said that that when media cover nuclear energy issues, the detriments are part of the coverage in every second article. Clearly, nuclear accidents trigger concrete coverage of direct detriments to the infrastructure and also of ionizing radiation. This result is not surprising. It is interesting to observe which other detriments are focused upon; the results show that detriments to the economy and the environment are reported the most frequently. Those two aspects can be advantages as well as disadvantages of nuclear energy. An accident can of course harm to the economy as well as the environment. At the same time, running nuclear power plants without accidents can have economic benefits as well as being environmentally friendly.

As with nuclear energy's benefits, its detriments can also be compiled into comprehensive categories like the five categories explained in chapter 2. In the category of technical detriments, this study counts the following: damage to the power plant, core melt-down, and susceptibility to failure. The category of economical detriments includes the economy, economical detriment caused by nuclear phase-out, rising energy prices, and economical compensation. The societal detriments include energy shortage and unliveable areas. The category of environmental detriments includes ionizing radiation, environment, nuclear waste, contaminated water outside the power plant, contaminated water inside the power plant, contaminated food, and radioactive contaminated animals. The last category, individual detriments, includes evacuation, radioactive contaminated or ill humans, dead humans, injured humans, and traumatized or confused humans. Overall, environmental detriments were covered the most, as they were discussed in 26 percent of all articles over the sample period. Technical detriments were covered in 22 percent of all articles. Economic detriments were covered in 16 percent, individual detriments in 11 percent, and societal detriments the least, in 9 percent of all articles. Figure 46 shows the distribution the detriment categories took over the analysed years. The environmental detriments were significantly more frequently covered than the other detriments in 2010 and 2011. The technical detriments gained significantly more attention after the accident in Fukushima and stayed at a higher attention level in comparison to before the accident until the end of 2013. The economical detriments significantly rose in attention from 2010 to 2011 and then significantly rose again in 2012 in comparison to 2011. Fukushima obviously triggered a discussion of economical detriments that was quite sustained. Societal detriments followed the same pattern as economic detriments, but were not covered as frequently as the economic perspective. The individual detriments instead rose in the accident year, only to drop in attention levels again in 2012.

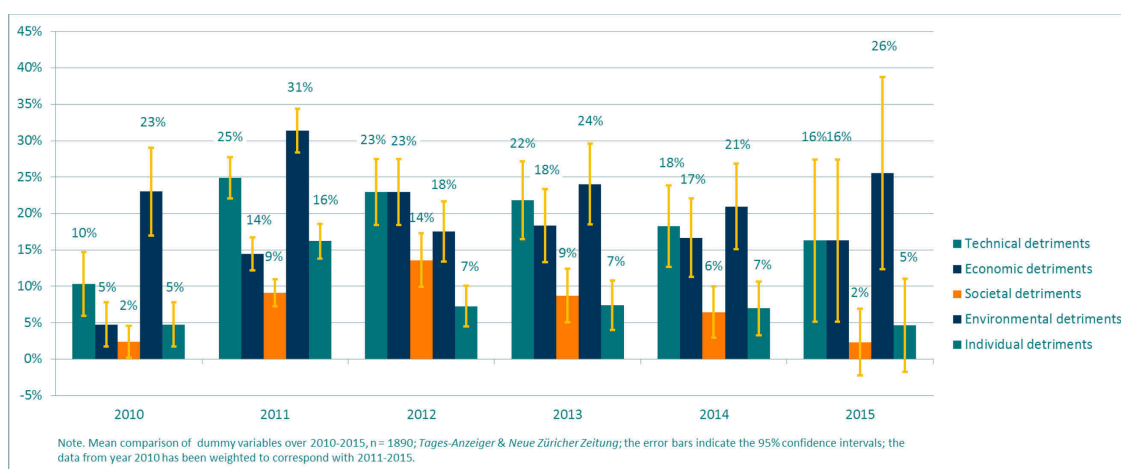


Figure 46 Detriment categories, 2010 to 2015

9.4.7. Risk Dimension Detriment Severity

The three detriment follow-up variables are mentioned more frequently than the benefit follow-up variables. The severity of detriments is the follow-up risk dimension that is mentioned the most; the media covered it in 28 percent of articles across the whole sample period. As Figure 47 shows, the accident in Fukushima greatly triggered the coverage of detriment severity. This possibly implies that the severity that was covered actually concerned the accident in Fukushima. However, a Pearson correlation between the topic block of the Fukushima accident and the detriment severity show a significant value of $r = .38, p < .001$. This indicates a relatively strong relationship between the two topics, but it also shows that the detriment severity is not always reported together with the Fukushima accident.

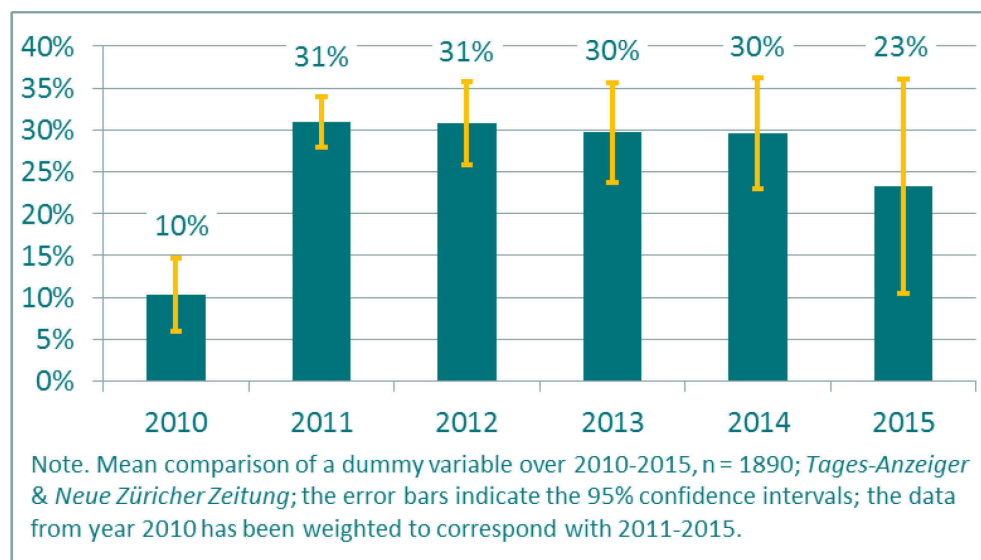


Figure 47 Detriment severity, 2010 to 2015

After the significant rise in 2011, there was no significant decrease in detriment severity reporting visible before 2015, when the amount of attention might have returned to a level similar to before the accident. Due to the small sample in 2015, this cannot be said with absolute certainty.

9.4.8. Risk Dimension Detriment Probability

The probability of nuclear energy detriments is the least reported detriment follow-up variable. The probability of a detriment happening is covered in ten percent of articles across the whole study sample period. As with detriment severity, attention to the probability of detriments rose significantly with the accident in Fukushima.

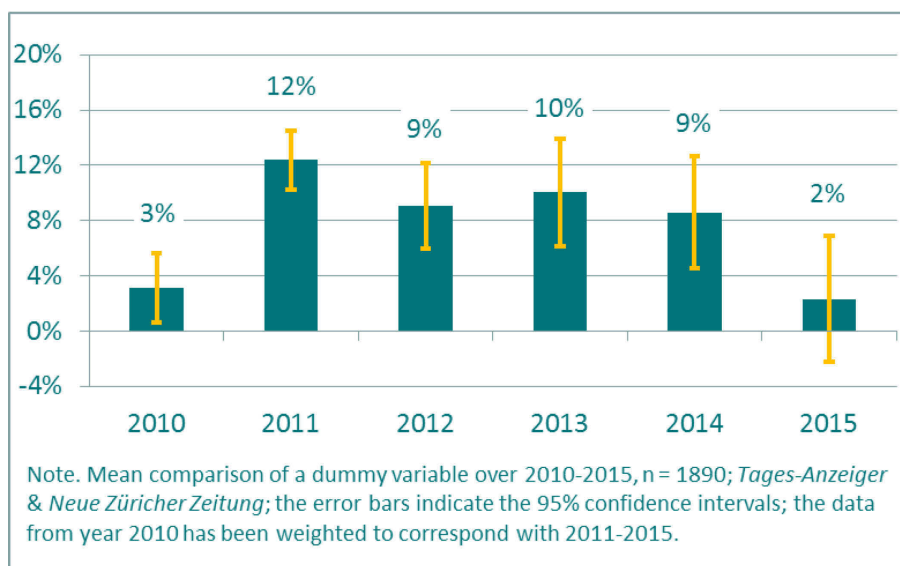


Figure 48 Detriment probability, 2010 to 2015

Figure 48 shows that prior to Fukushima, the value of three percent is just barely different from zero. In the accident year, however, the attention to detriment probability rises significantly compared to the year prior. However, in 2012 and in the following years, the amount of detriment probability coverage is already not significantly different from 2010⁶⁰. At the same time, however, the decrease in attention does also not significantly differ from the accident year, though Fukushima clearly triggered attention to the probability of detriments caused by nuclear energy.

9.4.9. Risk Dimension Detriment Uncertainty

The third follow-up variable regarding detriments is uncertainty, which was covered in 22 percent of all articles across the sample period.

As can be seen in Figure 49, media attention to the uncertainty of detriments rose significantly from 2010 to 2011. A one-way independent ANOVA shows that the amount of attention stayed at a significantly ($p < .05$) higher level throughout 2012 compared to 2010, but it returned to a similar level to 2010 in 2013. The attention level in 2013 was also significantly lower in 2013 than in the two previous years. The amount of attention given to uncertainty regarding detriments was neither significantly higher in 2014 than 2010, however, nor was it significantly lower than in 2011 and 2012.

⁶⁰ This was verified by a one-way independent ANOVA with a post-hoc Tukey test, $p < .05$.

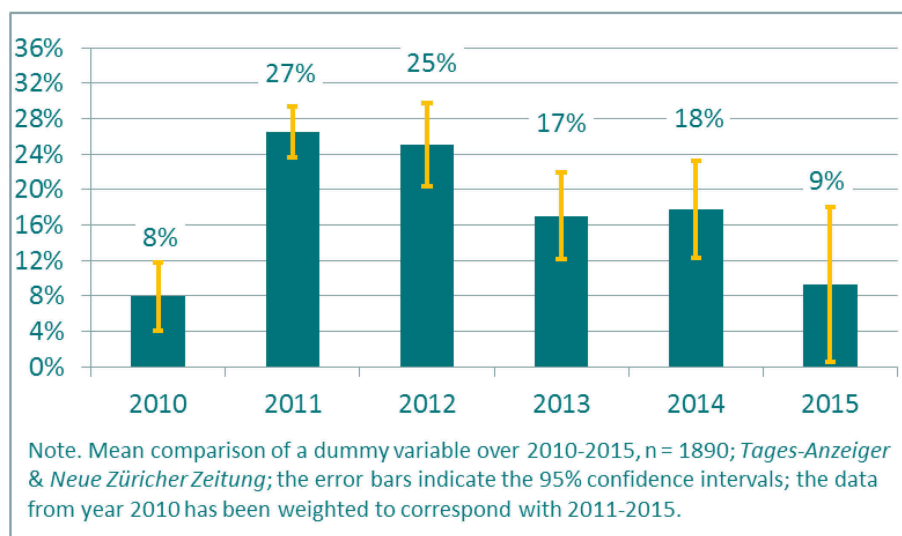


Figure 49 Detriment uncertainty, 2010 to 2015

9.4.10. Factor analysis of risk coverage dimensions

After having seen how specific risk dimensions behave over time, a factor analysis will be conducted in order to explore the groups of risk dimension variables that go together into factors. The underlying logic of factor analysis enables exploration of which variables correlate with each other and can be used to fit groups of risk variables.

A principal dimensions factor analysis was conducted on the 18 variables using oblique rotation (varimax). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, $KMO = .75$. According to Hutcheson and Sofroniou (1999), values over .7 are middling. Field (2013, p. 695) suggests all KMO values for single variables should be greater than .5. Only the variable of upcoming decision has a value lower than .5 (.493). The initial analysis to obtain the eigenvalues for each factor in the data resulted in five factors with eigenvalues above Kaiser's criterion of 1. Together they explain 52% of the variance. Table 13 shows the factor loadings after rotation. The variables that load on the same factor suggest that factor 1 represents nuclear detriments with focus on environmental detriments, factor 2 benefits of nuclear energy with focus on technical benefits, factor 3 economic and societal detriments and benefits, factor 4 decisions to keep nuclear energy and environmental benefits, and factor 5 upcoming decisions and environmental benefits.

Table 13 Summary of exploratory factor analysis results

n = 1890		Rotated factor loadings			
Variable	<i>Nuclear detriments with focus on envi- ronmental detriments</i>	<i>Benefits of nu- clear energy with focus on technical benefits</i>	<i>Economic and soci- etal det- riments and bene- fits</i>	<i>Decision to keep nuclear energy and envi- ronmen- tal bene- fits</i>	<i>Upcom- ing deci- sions and economic benefits</i>
Environmental detriment	.738				
Individual detriment	.680				
Severity detriment	.670		.414		
Technical detriment	.640				
Uncertainty detriment	.565			-.319	
Societal detriment	.381		.528		
Probability detriment	.373	.327		-.486	
Decision to phase-out nuclear energy	-.359		.318		-.607
Technical benefit		.651			
Degree benefit		.638	.342	.360	
Probability benefit		.629			
Uncertainty benefit		.613			
Societal benefit		.552	.412		
Economic detriment			.709		
Economic benefit			.493		.357
Decision to keep nuclear energy				.563	
Environmental benefit				.454	
Upcoming decision					.783
Eigenvalues	3.08	2.64	1.29	1.18	1.06
% of variance	17.15	14.66	7.20	6.60	5.92
Note. Factor loadings below .3 are not shown. ⁶¹ The strongest factor loading appear in bold.					

Note. Factor loadings below .3 are not shown.⁶¹ The strongest factor loading appear in bold.

This factor analysis shows that different risk dimensions correlate with each other and are covered together by the media. The first factor is a group of risk dimensions, which foremost occur as Fukushima happens. Environmental, individual, and technical detriments load high on this factor, together with detriment severity. This result seems to mirror the previously discussed results that showed how Fukushima turned attention to the detrimental side of nuclear energy. It also shows in combination with which detriments the more seldom detriment follow-up variables are covered. Clearly severity relates to the detriments caused by the accident, as does uncertainty. The probability of detriments loads the highest in this factor, but not as heavily as the other two follow-up variables. The second factor is mainly one that occurred before Fukushima happened,

⁶¹ Loadings are considered to be high if over 0.6, moderately high if over 0.3, and other loadings, so Kline (1992), can be ignored.

with a focus on nuclear energy's technical benefits, and their degree, probability, and also insecurity. This focus' occurrence mainly before Fukushima is also in line with the results previously discussed in this chapter. What is additionally interesting about this factor is that it reveals that degree, probability, and uncertainty load the strongest in a factor mainly discussing technical and societal benefits. Those variables are seldom covered, but this factor shows that when they are, they relate to technical and societal benefits. The third factor discusses both economical and societal detriments and benefits. This factor mainly occurs from 2012 forward. It also discusses the decision to phase-out nuclear energy. It can therefore be considered indicative of weighing nuclear energy's beneficial and detrimental sides in discussing a nuclear phase-out. It might also be a sign of reconsideration, which started to occur in 2012. The accident is not forgotten, but time has passed, and this point in time might be when detriments and benefits are discussed together in order to see what weighs heavier and how a future decision might be made. The fourth factor, which is defined by the high loading of the risk dimension to keep nuclear energy, occurred mainly before Fukushima happened, as did the fifth factor. The fifth factor showed high loading of the risk dimension of upcoming decisions. This finding also corresponds with the real world events and the time before Fukushima being a time during which a reinvestment in nuclear energy, which still had to be confirmed in a future decision, was causing media attention.

To summarize, the results of the factor analysis confirm what was seen in the more detailed data analysis over time for the individual risk dimensions. In addition to confirming those previously discussed results, the factor analysis contributes additional knowledge of which risk dimensions correlate and co-occur in the media coverage, and also when those defined factors mainly occur in time. The two most interesting factors might be the third and the fourth. The third factor seems to indicate coverage of the risks of detriments and benefits while discussing the phase-out decision. The point in time in which it mainly occurred starting in 2012 indicates that risk coverage needed some time to become balanced after such a large accident. The fourth factor regarding the decision to keep nuclear energy is interesting because it shows that when covering this decision, the media also engaged in coverage nuclear technology's environmental benefits and their degree. In times of much attention to climate change and how to mitigate it, the decision to keep nuclear energy in combination with its environmental friendliness seems like a logical result.

9.5. Interim conclusion – risk coverage

The second research question asked how the media cover risk. This question implies one of the main goals of this study, namely, to analyse media coverage in a broad man-

ner. This will add to the knowledge of previous analyses of single risk dimensions, like benefits and “risk” (i.e. detriments), and extend and deepen the knowledge of to what extent media cover not only the detrimental side of risks, or the beneficial side versus the detrimental side, but how media deal with all aspects that belong to a risk. As this study has defined them, those risk dimensions are decision, benefit and detriment. Connected to the benefits and the detriments are their degree (benefit) or severity (detriment), their probability (related to both benefits and detriments), as well as their uncertainty (concerning both benefits and detriments).

2. How do media cover risk?

The first thing to notice about risk coverage regarding nuclear energy is that the risk dimensions covered the most frequently are the detriments (49%), followed by the decision dimension (36%) and then the benefits (21%). Thereby, hypothesis four was supported, since there is more focus in the detriments than on the benefits. This result very much reflects the results of Kepplinger (1988), who showed that in German media’s nuclear energy coverage, a detriment was mentioned in half of all newspaper articles while benefits were mentioned in every fourth article. In contradiction to Kepplinger’s results, however, is the coverage of the benefits and detriments as actually occurring or as potential. Kepplinger’s result showed highly speculative media coverage, as detriments and benefits were reported upon as possible rather than actually occurring. The data in this study, however, show clearly that both benefits and detriments are more often covered when actual. Actual benefits are covered in 23 percent of articles versus potential benefits in nine percent, and actual detriments are covered in 64 percent versus possible detriments in 37 percent. Kepplinger studied a longer time period reaching from 1965 to 1986, however, which could have influenced his results, though two larger nuclear accidents occurred in his sample, Three Mile Island in 1979 and Chernobyl in 1986. Before either stating that media coverage has changed since 1986 or might be different in Germany than in Switzerland, one would have to know more precisely how Kepplinger operationalized in his analysis.

However, since the sample period stretches over a time period in which a key event, a large accident, occurred, this result has to be relativized and looked at across different time periods. If the year before Fukushima is considered as more or less representative for nuclear energy risk coverage when no large nuclear accidents occur, the data show in 2010 that decisions were covered the most (44%), followed by detriments (34%) and benefits (32%). The decision dimension was covered significantly more often than both the benefit and detriment dimensions. This would imply that nuclear energy risk coverage is mostly concerned with the risk decision. Friedman (1986), who studied

newspaper coverage in Harrisburg, US, before the accident on Three Mile Island, also observed coverage dealt much with licensing hearings. This might be mirrored in this study, as 2010 was a year in which new licenses were also causing discussion in Switzerland and that 2010 might not be such a “normal” year for the nuclear energy coverage after all. There were three general licenses for new nuclear power plants being discussed during this time, which might have influence on the data that is shown in this study. The question is however, if there is ever any “normal” nuclear energy coverage to be observed. Do news media cover nuclear energy when nothing—no decisions, no accidents, or no new benefits—is on the agenda? This study cannot answer that question, but it can show that media do cover nuclear energy’s risks as defined by this study. Somewhat surprisingly, furthermore, Swiss media do cover the detriments as well, even in times where no large accidents are present, as the case of 2010 shows. This might imply that media do cover risks. Even when risks do not cause detriments, news media do engage in the deliberation of risk in a broad manner. Possibly, however, news media might not cover nuclear energy risk when nothing at all regarding nuclear energy is happening either in nuclear power plants or on the political arena.

Stating the more obvious, as Fukushima happened, media coverage of detriments and their follow-up variables changed dramatically. The media attention on nuclear detriments stayed at a high level and only reached a similar level to 2010 in 2014. This implies that when a large nuclear accident happens, media risk coverage changes for years to come. The two studied Swiss newspapers engaged in detriment coverage for three years. In 2014 (and 2015), the attention on the detrimental side of the nuclear energy still stayed high as almost every second article covered detriments. The coverage of nuclear energy’s beneficial side did drop off in the accident year, but reached a level in 2012 similarly high level to that of 2010. However, benefit coverage fluctuated. In 2013, benefits already lost media attention again, only to regain it in 2014. The decision dimension lost attention somewhat in the accident year, only to regain media attention in 2012, but after that slowly decreased. Arlt and Wolling (2014) found similar patterns in their study of German news coverage before and after Fukushima. Their operationalization is most probably different from the one utilized in this study; however, their data suggest a decrease in attention to economical topics and the benefit of nuclear energy’s environmental sustainability after Fukushima. This study also observes decreasing attention on economical topics, economical benefits, and environmental benefits. However, the differences regarding those topics or benefits observed in this study, when comparing before and after Fukushima, are not significantly different. Beyond operationalization differences, those contradicting results might be due to the fact that Arlt and Wolling’s study (2014) only investigated the three months after Fukushima. More likely, however, is that this reflects a difference between countries. Germany was

more immediate and determined in their phase-out decision than Switzerland. This might well have been mirrored in each country's media coverage, causing a more clearly changing media focus of those aspects.

Regarding the follow-up benefit and detriment-related risk dimensions, that is, degree, severity, probability and uncertainty, the data suggest that the media least often engage in probability coverage both regarding benefits and detriments. This might be because information about the exact probabilities is unavailable (to the media), or this information seems irrelevant. Looking at changes over time, media coverage of detriment probability increased after Fukushima. Therefore, it could be that probabilities are mostly of concern when a detriment occurs and when the likelihood of something similar happening again is of interest to the media as well as to risk takers. The result that detriment probability infrequently discussed by the media can be compared to the similar result Fretwurst (2014) observed in German media coverage of Fukushima. He measured what he terms "risk", which probably is close to the operationalization of detriment probability in this study, and found that "risk" was covered in about ten percent of German coverage of Fukushima until the beginning of July 2011. The data collected in this study show media coverage of detriment probability in twelve percent of all 2011 articles. Therefore, it does not seem to be specific to Switzerland that detriment probability is little covered.

On the other hand, media give the most attention to the follow-up variables concerning the degree of benefits and the severity of detriment. This might imply that those are two risk dimensions important to risk takers. Of course, coverage of detriment severity rose significantly in the years following Fukushima, but the data show that even if the degree of benefits were of less interest, they were also covered in the accident aftermath. If risk taking is considered a weighing of benefits and detriments against each other, it seems logical that the degree or severity of each would be quite relevant. If a benefit promises only a low degree of benefit and a possible detriment a very high severity, it seems reasonable that the risk would not be taken in the first place. If instead the benefit degree is very high and the potential detriments only would cause very small detriments, then it seems highly probable that the risk would be taken. In the case of nuclear energy, however, the benefit degree is high as is the potential severity of detriments. This makes the risk taking complex, and might be a contributing factor to the frequent media coverage of those two dimensions.

Benefit uncertainties are not frequently covered, but detriment uncertainties are. Before Fukushima, both risk dimensions attracted quite little media attention. Coverage of uncertainty regarding benefits stayed at a similar level, but that of uncertainty regarding detriments rose significantly and stayed at a high level for years after the accident. On

the one hand, this might be due to uncertainty regarding the event in Fukushima. An accident of that magnitude is hard to understand fully and might well trigger media coverage of this fact that information is sparse and that no one knows what is happening in the damaged power plant. On the other hand, the uncertainty staying at such a high level throughout the following years, after most immediate questions about the Japanese plant had been answered, might imply that nuclear energy's detriments are uncertain. Because accidents happen so seldom, the probability seems very low that accidents happen. On the other hand, since accidents can be caused by human error, the uncertainty can be considered to be relatively high. It seems improbable that there would be very exact data on the likelihood of a person working in a nuclear energy plant to cause an accident. Beyond that, nature causes accidents, as in the case of Fukushima, and nature cannot (easily) be controlled. Earthquakes are uncertain, and in the case of Switzerland they might be relevant to the safety of nuclear power plants. In addition, the safety standards of other nuclear energy producing countries might be out of reach and difficult even for those countries to reach themselves. This too might influence uncertainty regarding nuclear energy detriments.

Summarizing those results, when covering nuclear energy, which is a risk, media cover the risk dimensions decision, benefits, and detriments. When a large nuclear accident occurs, more attention is given to the detrimental side of the technology. However, the beneficial side is not forgotten, even if it gets less attention shortly after the accident. As stated previously, nuclear energy is a political issue; this is also obvious in media coverage of the decision dimension. Therefore the answer to the second research question is that media do cover nuclear energy risk in a broad manner. However, the probabilities of benefits and detriments seem irrelevant or difficult to cover. In general, it seems the probability and uncertainty of the technology's benefits get very little attention. This might, however, be due to the fact that if the probability and uncertainty of a benefit occurring were very low, a risk might not be taken in the first place and would therefore also not attract any media attention. This result might rather be a characteristic of the risk itself rather than of the media coverage.

9.6. Phase analysis

The previous chapter detailed how risk dimensions are covered over time, and as can be seen, there is some variation. This chapter, based on previous studies exploring phases in media coverage, will undertake a phase analysis of the risk coverage regarding nuclear energy. The analysis will be based on the risk dimensions and answer whether there is a phase pattern to risk coverage. Can the hypothesized phases in 7.1 be confirmed, or does the risk coverage take another pattern across the analyzed period of time? Which

risk dimensions define different risk coverage phases? These questions will be discussed and answered in the following part of this study.

For the phase analysis and phase identification, dummies of the main risk dimensions will be used. This means there will be one dummy variable for decisions, one for benefits, one for detriments, and three follow-up variables regarding benefits and detriments. For each phase, the risk dimensions defining that time period will be identified and analyzed in more detail. This means that, for example, a risk dimension occurring very seldom—like the probability of benefits, which only occurs in two percent of all articles across the sample—will be omitted in the detailed analysis, since it does not contribute to the variance. When the most important risk dimensions for a certain time period have been identified, these will be plotted in a bar graph showing their average monthly occurrence and error bars indicating the 95% confidence intervals. By looking at these bar graphs, patterns will be identified. In cases where phase borders are not obvious, additional variables, such as real time events and amount of coverage will be turned to in order to make sense of a perhaps only slightly changing pattern. As Downs (1972) stated, phase transitions can in some cases be subtle. Given the issue, it is not likely that phases will be abruptly ending and starting, other than when a key event like Fukushima occurs. As a method of verification, subtle phase transitions can be back-tracked by an analysis of significant changes between the tentative identified phases. Concretely this means identifying phase transitions, defining those phases in the data and assigning the articles to those phases and in a next step check if significant changes in the defining risk dimensions hold true. If the phases would show no significant changes regarding the defining dimensions, the monthly pattern of changes in certain dimensions will be consulted anew, taking other variables into account such as amount of coverage, covered topics, cited actors or real world events. If no phase transition can be found with this method, and the coverage is more or less the same across time, then that will be the result of the phase analysis, resulting in, for example, a single long phase in which the risk coverage pattern does not change significantly.

In addition to the hypotheses regarding the focus of different risk dimensions at different points in time, this study poses additional hypotheses of other factors that might be defining for the phases, for example, specific topics which might be more focused upon during certain times, or actors given more or less media attention, as well as the amount of coverage. These variables will serve as additional variables identifying the phases and they will be consulted to answer additional hypotheses regarding the phases. At the end of this chapter, after the phases have been explored and defined, the topic and actor variables will be part of a multinomial logistic regression, which will supply additional information on how topics and actors behave across the phases, with the first phase

serving as reference. This analysis will supply additional knowledge, beyond the already studied specific topic and actors, which are part of some of the hypotheses.

9.6.1. Phase One – a prospective risk deliberation

This study assumes that a rather “normal” risk coverage phase can be found before Fukushima. Since 2008 there has been discussion regarding new nuclear power plants in Switzerland. In 2010, this discussion was still ongoing. This might be one contributing factor to the characteristics of the nuclear energy coverage in 2010, and might well also be a reason why nuclear energy was covered by the media at all. Since Fukushima was a key event, which obviously was severe enough to change politics in several countries, the first assumption regarding media coverage phases is that the first phase of nuclear energy risk coverage lasts until the accident. With the assumption that 2010 could be part of a first phase, the time period stretching from the beginning of 2010 until shortly after Fukushima shall be closely investigated here.

First, looking at which risk dimensions are most prominent in 2010, as can be seen in Figure 50, decision, benefit and detriment are the most significant commonly covered risk dimensions.

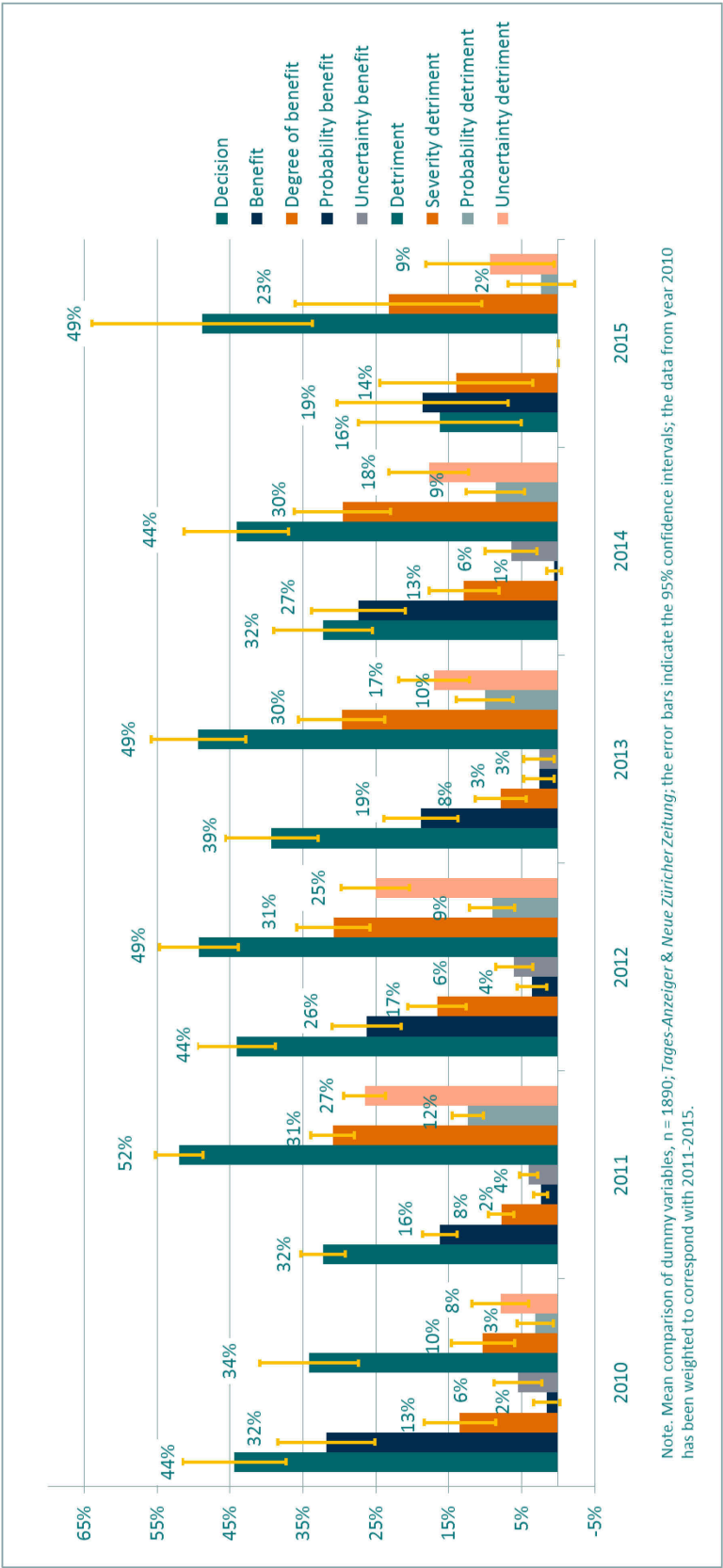


Figure 50 Risk dimensions 2010 to 2015

The decision dimension is the most covered risk dimension in 2010 and it drops significantly in 2011, as does too the benefit dimension, whereas the detriment dimension significantly rises. Therefore, the first phase is assumed to last until this significant change happens. In order to see when exactly this changes, Figure 51 zooms in on this particular time period and concentrates on those three risk dimensions, which seem to be causing a changing pattern at some point in time in 2011. The mean comparisons of the three risk dimensions are analyzed as dummies. Figure 51 reveals that the period from 2010 and up until Fukushima in March 2011 is a more or less homogeneous phase. However, there are two significant peaks occurring during 2010 which shall be pointed out. The first one is the significant rise of the dimension decision in September 2010. The dimension is significantly more often covered compared to the month before and after, and also compared to the other two risk dimensions, benefit and detriment. This peak has to do with Germany's decision to keep nuclear energy instead of, as previously decided, to phase-out nuclear energy. This decision was made by the German government in September 2010 and is visible in the data here, driving the decision dimension peak in the Swiss media's nuclear energy risk coverage. Because coverage of the decision dimension returns to the level it had before September 2011, this peak is not considered to be a trigger for lasting change or a new phase in the risk coverage. The peak can clearly be connected to the German decision, which triggered news coverage of this event. The second peak out of note is the one of detriment in November 2010. The risk dimension is covered significantly more in November than in the month before. This traces back to another German event, namely, the conveyance in November 2010 of casks for the storage and transport of radioactive material (CASTOR), which triggered the coverage of the detriment of nuclear waste. Since this is a single event, and the mean of the detriment dimension returns to the level as before November 2010, this is also not considered a turning point for a new phase in the Swiss risk coverage.

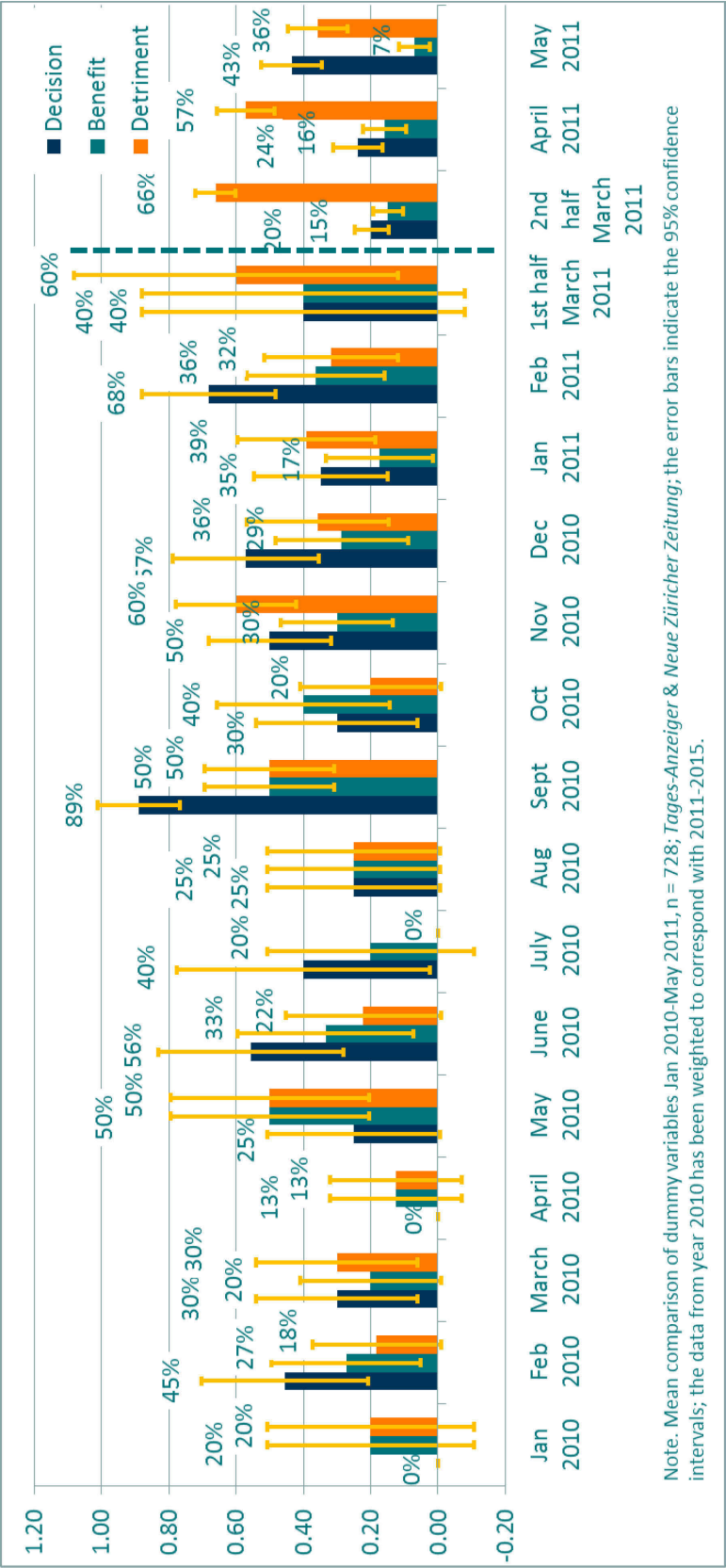


Figure 51 Decision, benefit and detriment January 2010 to May 2011

The data suggest that the first phase cut off when the accident happened in Fukushima. When comparing the first half of March 2011 to the second half of this month, i.e. after Fukushima, it is obvious that Fukushima triggers a change in the risk coverage. The detriment dimension peaks significantly compared to the decision and benefit dimensions. This pattern is the same in April 2011. In May 2011, however, the decision dimension comes back into focus, as it is no longer covered less significantly than the detriment dimension. This will be more closely explored in the analysis of the second phase.

To sum up the first phase, when focusing on the three most significantly covered risk dimensions of 2010—decision, benefit and risk—the first phase of risk coverage stretched from at least January 2010⁶² up until the second half of March 2011. The data show that the time before Fukushima made for a phase in which attention is directed to the risk dimensions decision, benefit and, somewhat surprisingly, also to detriment. Those dimensions are reported by journalists in between 32 to 44 percent of all articles in 2010. It can thus be suggested that the phase before Fukushima was a deliberative moment. Not only are the decision and benefit dimensions in focus as might be expected due to the planning of new nuclear reactors at that time, but the detriment dimension is also being discussed in the coverage. Therefore, it seems to be a moment of deliberation on benefits and detriments and how to decide upon nuclear energy. This leads to answering the fifth hypothesis that this study proposes:

H5: Before the Fukushima disaster, the risk dimensions of benefit and decision were the focus of media attention to a higher degree than after the accident.

The data suggest that before Fukushima, the risk dimensions of benefit and decision were in focus. However, detriments were also in focus. To further test the hypothesis which assumes the benefits and the decision will be focused upon more before Fukushima than after, a before-and-after comparison will be carried out here next. This comparison will show if the decision and the benefit coverage was really stronger in 2010 than after Fukushima, and will also give a hint if the coverage “recovered” and took on the old pattern again during the analyzed years after Fukushima. As Figure 52 shows, Fukushima did have a strong effect on the media coverage of nuclear energy benefits. Before Fukushima, those were discussed in 31 percent of the articles; in the years after the accident, those were discussed significantly less often, or in 20 percent of all articles. So even if it were to be the case that the benefits do regain attention after an

⁶² Because this study does not analyze any coverage preceding 2010, it is impossible to say how long this risk coverage pattern has been taking place.

attention dip around Fukushima, the data show that the focus on the benefits of nuclear energy does not recover to the level it had before the accident.

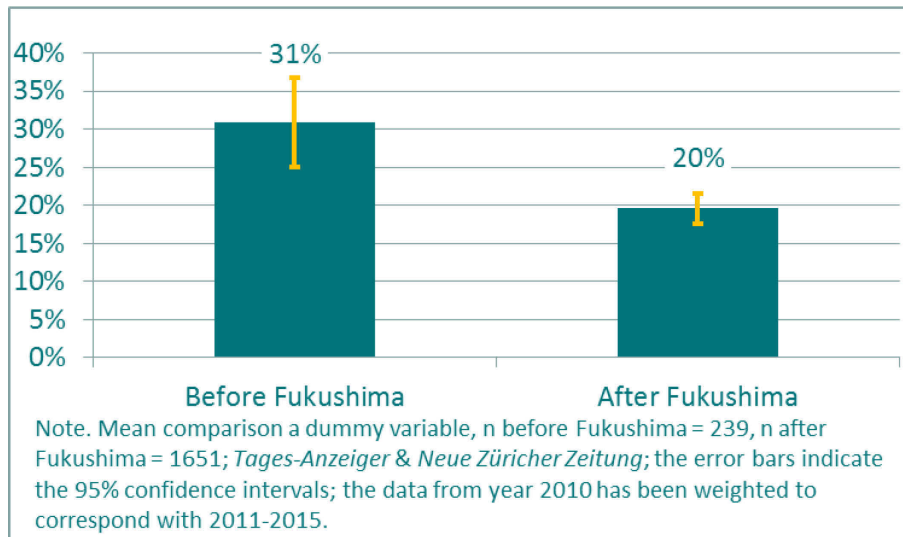


Figure 52 Comparison of benefit before and after Fukushima

The decision dimension was put to the same test. As Figure 53 shows, the same pattern is true for the decision dimension. There is significantly more coverage of decisions in the time period from January 2010 up until Fukushima than there is after the accident.

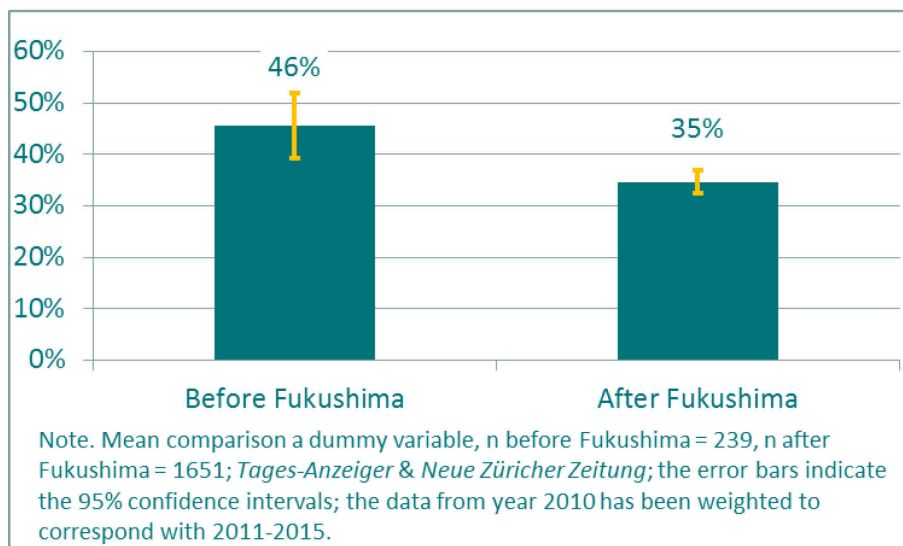


Figure 53 Comparison of decision before and after Fukushima

It is also true for the decision dimension that it is significantly more often covered before the accident. It was an issue in almost every second article before Fukushima, dropping to 35 percent of discussions after the accident. This defines the phase before

Fukushima as a phase in which the benefits and the decision were in focus. By that, the fifth hypothesis can be confirmed.

The sixth hypothesis regards rather general coverage questions which help put the risk coverage into context.

H6: Before Fukushima, nuclear energy is expected to trigger sparse media attention, which focuses on:

- economic and policy topics,
- politicians and nuclear operators, and
- a rather positive and uncontroversial tone.

In chapter 9.1 and 9.2 some of those results have been discussed already, showing that Swiss energy policy (56%), foreign energy policy (28%), German energy policy (25%) and the Swiss economy (25%) were the most discussed topics in 2010. There was at least one Swiss political actor speaking in 38 percent of all articles in 2010, at least one foreign politician in 33 percent, and at least one nuclear operator in 29 percent of the articles; those three types were the most cited prior to Fukushima. The coverage was not positive, but neutral, with around every sixth article having a controversial tone.

The data that have not yet been shown for this hypothesis will be evaluated here to put the risk coverage in context. Answering the question as to whether the media attention before Fukushima was sparse requires some additional analysis. Regarding the amount of coverage, the nuclear energy issue was generating less media coverage in 2010 compared to 2011, as can be seen in Figure 54. This figure shows the average of the actual number (i.e. not just the sampled number) of articles per month, per year. In 2010 there were, on average, 32 articles published per month, or about one article per day. This is less compared to 2011, 2012 and 2013, but it is not as little as might have been expected. Based on the number of articles, it can be said that the year before the Fukushima event is comparable to 2013 and the following years. Fukushima did trigger a larger amount of media coverage in 2011 and this lasted until 2012, but then returned to a similar level as before the accident. For two years, the media focused on nuclear energy issues more than before the accident.

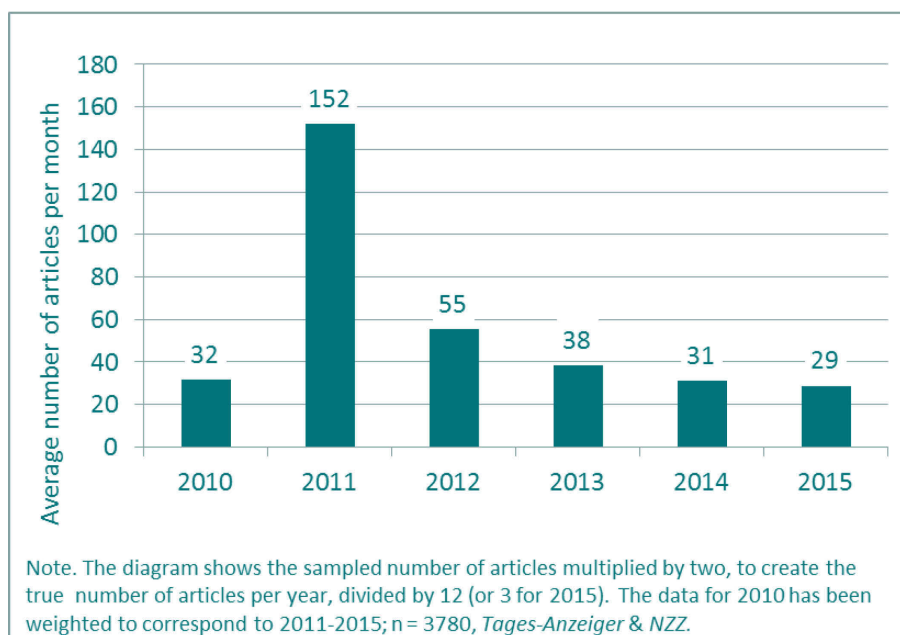


Figure 54 Average number of nuclear energy articles per month, 2010-2015

To assess not only the number of articles, but also the amount of space the issue was given, the average article length shall be analyzed and compared over the years. Figure 55, shows that in none of the years, was the nuclear issue given significantly more attention in the form of longer articles, since the mean is not significantly higher or lower in any of the years, therefore also not in 2010 compared to the other years.

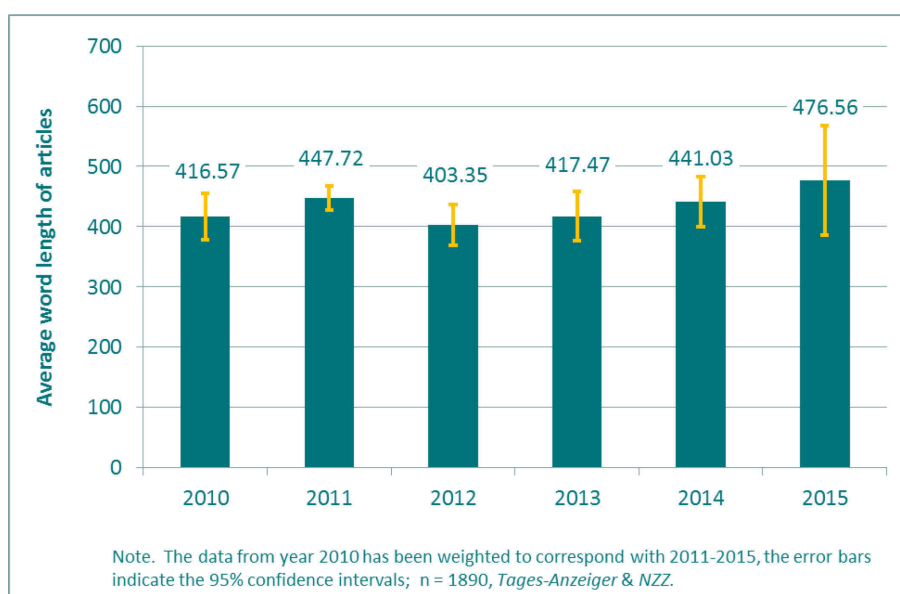


Figure 55 Average length of articles

Considering those two results—that there was, on average, one article published every day on nuclear energy in 2010, and that the average length of those articles was not significantly lower than in any of the other years—it can be said that nuclear energy was given the same amount of media attention in 2010 as two years after the Fukushima accident. Therefore, the attention was sparse compared to the accident year but not compared to the attention the issue seemed to get in general. The result is somewhat ambivalent. The attention is sparse compared to the accident year and its aftermath the following year, but not compared to other, more “normal” years. For the risk coverage phase, it could be concluded that the risk dimensions benefits and decision were given, on average, as much attention as the nuclear issue in routine coverage.

In contrast to this ambivalent result that does not clearly validate the hypothesis or falsify it, the other assumptions seem to be true for the first phase. Domestic and foreign policy as well as economic topics were in focus, Swiss and foreign politicians as well as nuclear operators were the most cited actors, and coverage was neutral (not positive) and as controversial as in any other years (which was not much in general; 14 percent of the articles were controversial in 2010).

To conclude, can the first phase be called the phase of “prospective optimism” as suggested in chapter 7? Since the benefits of nuclear energy were given much attention and the upcoming Swiss decision was in focus, it was a prospective phase, but since the journalistic bias was not overly positive and was instead neutral, “optimism” might be too strong an expression. The stronger focus on economic topics in 2010 might, however, allow for the interpretation of a sign of optimism. Nevertheless, it was rather a prospective risk deliberation, since it was neutral in tone, strongly focused on the decision and benefits, but also detriments, and energy policy. Therefore, the first phase will not keep the name initially given, but will instead be called a *prospective risk deliberation phase*.

9.6.2. Phase Two – detriment coverage

The second phase was assumed to be a phase which could go under the name “media storm.” This chapter will analyze not only the amount of coverage that Fukushima triggered, but also which risk dimensions were emphasized in the media coverage.

The most commonly covered risk dimensions in 2011 were evaluated as shown in Figure 56. Just as the first phase was said to be put to an end by Fukushima, the second phase is assumed to start with the accident, with hypothesis seven assuming:

H7: Fukushima will trigger a focus shift to the risk dimension detriment, its severity, and uncertainty.

Fukushima clearly did trigger a focus shift to the detriments, putting the decision dimension, which was in focus in the first phase, in the background. In 66 percent of all articles in the second half of March, detriments were discussed and that was a significant rise of attention compared to the 32 percent of articles which covered detriments in February 2011. The question is, how long would this pattern of strong detriment focus last? In April 2011, the detriment dimension did lose some focus (57%), but the decrease was not significant compared to the second half of March. It was first in May 2011 that the coverage of the detriments decreased significantly, to 36 percent compared to April. In May instead the decision dimension took a slight lead again, and was covered significantly more than in the two previous months. Also defining for the time after the accident is the coverage of the detriment severity, which was much discussed after the accident (44%) and throughout April (37%). Uncertainty regarding the detriment was also high in March (39%), but significantly lost attention in April (25%). This might have to do to the initial uncertainty regarding what was really happening in the power plant. It was only on May 25 that Tepco communicated the nuclear meltdowns. This rather long time of uncertainty and speculation about a nuclear meltdown is obvious in the Swiss media coverage. Overall, these results indicate support for hypothesis seven. Fukushima did direct the focus of media risk coverage to the detriment, its severity and the uncertainty regarding it.

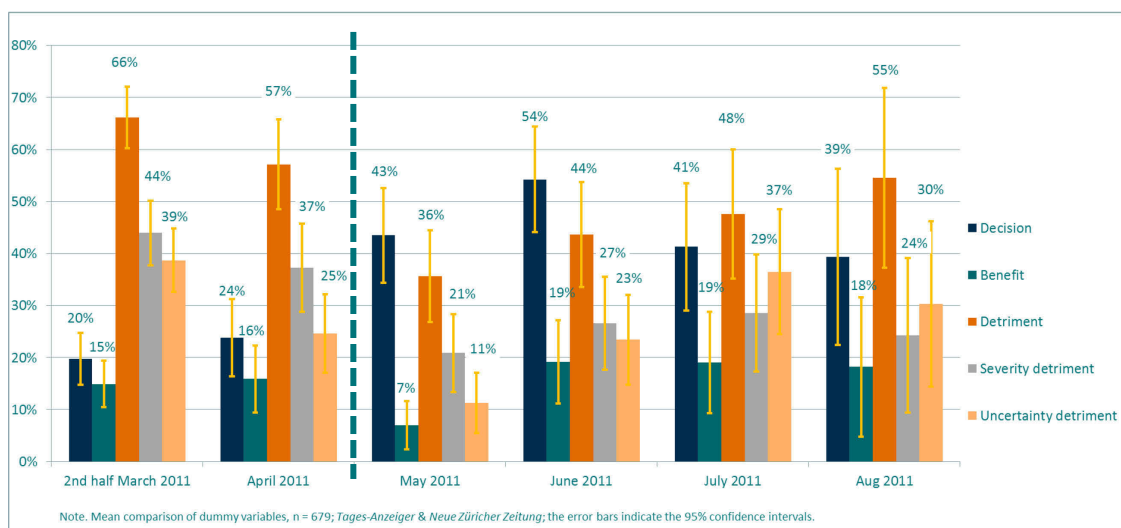


Figure 56 Risk dimensions phase two

Hypothesis eight aimed to put the risk coverage in a broader context and assumes the second phase to be a phase with risk coverage focusing on the accident itself as a topic, as well as certain actors, experts, scientists and nuclear operators, and additionally assumes a neutral tone of the coverage.

H8: Fukushima will trigger media attention on:

- the accident itself,
- statements from experts, scientists and nuclear operators, and
- the overall tone will be rather neutral.

Figure 57 compiles the topic of the accident with the actor types of scientists and experts as well as nuclear operators. In order to observe a change from before Fukushima, February 2011 is also depicted. Not surprisingly, the data show that March and April were months where clearly the topic of the media coverage was the accident itself. The attention was directed to the accident in over 85 percent of the articles after the accident. In April there is a significant decrease of attention directed to the topic (71%), and the declining trend continues in May (48%). After May 2011, the topic of the articles is still often the accident itself, due to some ups and downs. Since it was an accident with a long aftermath and with several additional problems, for example the issue of the cooling water, the media focus on the accident itself even in the following months is not unexpected. However, the significant gap in the accident coverage between April (71%) and May (48%) confirms the results of the risk dimension analysis, which puts an end to the second phase at the end of April 2011.

Furthermore, hypothesis eight also predicted a rise of attention directed to the actor types of nuclear operators and scientists and experts in the second phase. However, there is no significant rise in attention to nuclear operators after Fukushima, as Figure 57 shows. Nuclear operators were already, before Fukushima, the second mostly cited actors after Swiss politicians.

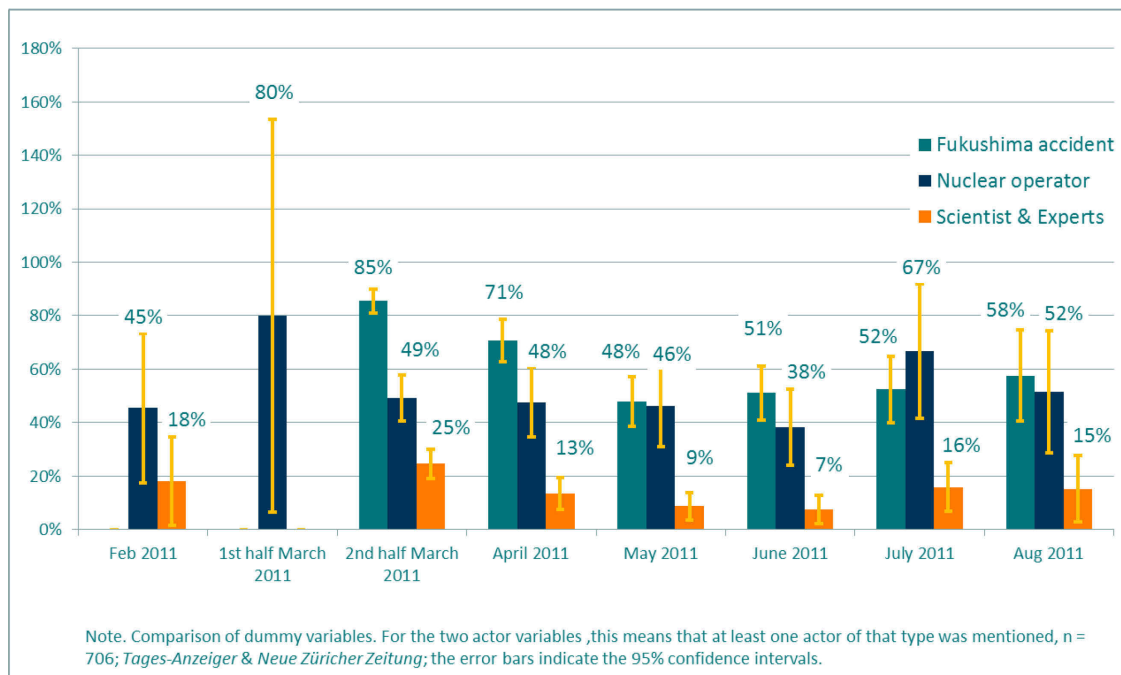


Figure 57 Topic Fukushima accident and actors

In fact, nuclear operators seem to stay on a quite stable level over time if looking at the 95 percent confidence intervals. Scientists and experts are not covered much in general, but a slight focus can be identified in March after the accident. Therefore, the assumption that scientists and experts are asked for their statements more often directly after an accident of that severity can only be considered partly true. The German news coverage of Chernobyl showed that the second largest actor group was that of scientists and experts. This strong focus on scientific experts cannot be confirmed in this study. Potentially this could be a sign of a general higher knowledge of nuclear energy. It might be that scientific statements and information are not as much needed today as they were 25 years ago when Chernobyl happened. This is only speculation, but it would explain why scientists and experts were not cited to a higher extent than they were after Fukushima.

Regarding the assumed neutral bias, it can be said that it is not the case that media covered nuclear energy in a neutral tone after Fukushima. In fact, journalists seem to use the occasion of the accident to report on nuclear energy in a negative way. In February the variable journalistic bias⁶³ had a mean value of -14, which, however, was not significantly different from zero. In the second part of March this value was -22, and the bias stayed clearly negative in April with a mean value of -20; both these values were significantly different from zero. Therefore, Fukushima can be said to have triggered

⁶³ The journalistic bias was coded on the range of 1=positive, 0=neutral and -1=negative.

negatively biased coverage of nuclear energy. In May 2011 the coverage returned to neutral, but turned negative again after that. Therefore, taken together, the results regarding hypothesis eight only support it partially. It is clearly a phase in which the accident is *the* focus of the coverage, and scientists and experts are asked for their statements to a very slight higher degree immediately after the accident as compared to before the accident. However, nuclear operators do not generate more attention and the coverage is not neutral, but clearly negative.

Turning to the last hypothesis of this phase, the interest is in finding out if Fukushima triggered a media storm as defined by Boydston et al. (2014).

H9: This phase will include:

- a 150 percent increase in media attention to nuclear energy, where
 - 20 percent of all news stories will deal with the nuclear issue,
 - for at least one week.

The 150 percent increase in media attention to the issue of nuclear energy is given. The two newspapers published 44 articles on nuclear energy in February 2011 and 506 in March 2011, more than ten times more. Additional analysis of the front pages⁶⁴ (calculating the surface area of the articles and their pictures) shows that they cover more than 20 percent of the front pages for at least one week. Further, if calculating by the number of articles and headlines covering nuclear energy on the front pages, the coverage could also be said to cover 20 percent of the front pages, and that this amount of attention lasted for at least one week. These results of the front page analysis can be taken together with the general number of articles covering nuclear energy. Analyzing the number of newspaper articles across the months before and after Fukushima, the data show that a similar number of articles, compared to before the accident, was only reached in January 2012. Thus, for the whole time from mid-March 2011 until almost one year later, the newspapers covered nuclear energy to a higher degree than before the accident. Even if January 2012 was the first month after Fukushima which involved a similar number of articles as compared to before the accident, this does not mean that the media attention stayed at this rather low level. Again after January 2012 there was more coverage than before the accident. January 2012 was just the first month in which the number of articles returned to a similar level as before the accident. Therefore it can be concluded that Fukushima did trigger a media storm, as it is defined by Boydston et al. (2014).

⁶⁴ Since this study does not know how many articles were published in total in the newspapers, the 20 percent was accounted for by analyzing the front pages of both newspapers.

As the authors claimed, media storms would have different dynamics than non-storm coverage. This study shows that at least the attention to risk dimensions changed with Fukushima, and the risk attention pattern was then in some aspects more or less stable for about six weeks after Fukushima. However, the media storm concept still needs more research to verify that the numerical thresholds always produce media coverage that has different dynamics than non-storm coverage. If nothing else, it might be an applicable model to solve the problem that there is no definite way to tell a key event from a “normal” event. However, then it is rather an instrument measuring the degree of attention.

To sum up the results of the second phase, the data show that Fukushima triggered an explosion of media coverage, which concentrated on the accident itself and the detriments it caused. The severity and the uncertainty regarding the detriments were also important issues in the coverage. Scientists and experts were evaluating the situation in every fourth article, and journalists covered nuclear energy in a negatively biased way. This pattern in the media coverage lasted for about six weeks following Fukushima. After six weeks, the decision risk dimension returned as a focus and the media coverage turned rather neutral again. Therefore, the assumption that this phase was going to be essential for risk coverage can be partly validated. The accident did trigger the media to focus on the detriments. However, the detriments were, against the initial assumptions, also covered before the accident happened. The detriments were not as present in the media coverage before the accident as shortly after, but they were part of the risk coverage before Fukushima. With the vast amount of coverage after Fukushima, the issue of nuclear energy and the Fukushima accident could hardly remain unrecognized by anyone. Without an accident of this severity, the detriment, and especially its potential severity, would, I assume, never have triggered that much attention and might therefore seem distant and highly unlikely to people. Instead, Fukushima and the media coverage of the accident brought into intense focus the possible severity of nuclear energy accidents. The world until now has only experienced two nuclear energy accidents of that severity (Chernobyl and Fukushima), therefore the probability of such events seems to be low. The probability, however, was not much covered by the media during this phase.

Regarding the name of this phase, the name “media storm” (Boydston et al., 2014) was suggested in chapter 7. The data show that the accident did trigger a media storm as defined by Boydston et al. Concerning risk coverage, however, it is not only a “storm” due to the amount of coverage rising—the phase after Fukushima is one in which the detriment risk dimension is focused on strongly. Therefore, the name *detriment coverage* seems more informative and suited for this risk coverage phase. Severe accidents

like the one at Fukushima will most probably trigger media to focus on the detriment and its severity. However, not every media storm has to be triggered by an accident or cover risks. To make this distinction clear, I chose to call the second phase *detriment coverage*.

9.6.3. Phase Three – *detriment deliberation*

After the detriment coverage phase, phase three is assumed to be a phase in which an immediate reaction to the accident takes place, which can be observed by the decision dimension regaining attention. Indeed the data show a significant attention increase to the decision dimension in May 2011 compared the detriment coverage phase. During the detriment coverage phase, the decision dimension was covered in 21 percent of all articles, while in May 2011 the focus rose significantly to 43 percent ($p < .001$). As Figure 58 shows, the decision dimension remains the main focus throughout June 2011; however, in both these months, the decision is not significantly more covered than the detriment. On the other side, the detriment dimension is significantly less covered than during March and April 2011, but obviously does not immediately disappear out of focus. The decision and the detriment more or less co-exist, and both are due to some fluctuation. The interchanging of the two risk dimensions being covered slightly more is not considered to be a sign of a fourth phase beginning. Rather, the third phase is assumed to last until something more radical changes in the risk coverage, namely that the benefit might regain attention. Behind this assumption lies the consideration that there might come a point in time in which the beneficial side of the technology is “remembered” and is again “allowed” to speak. Whether this happens is, of course, an empirical question.

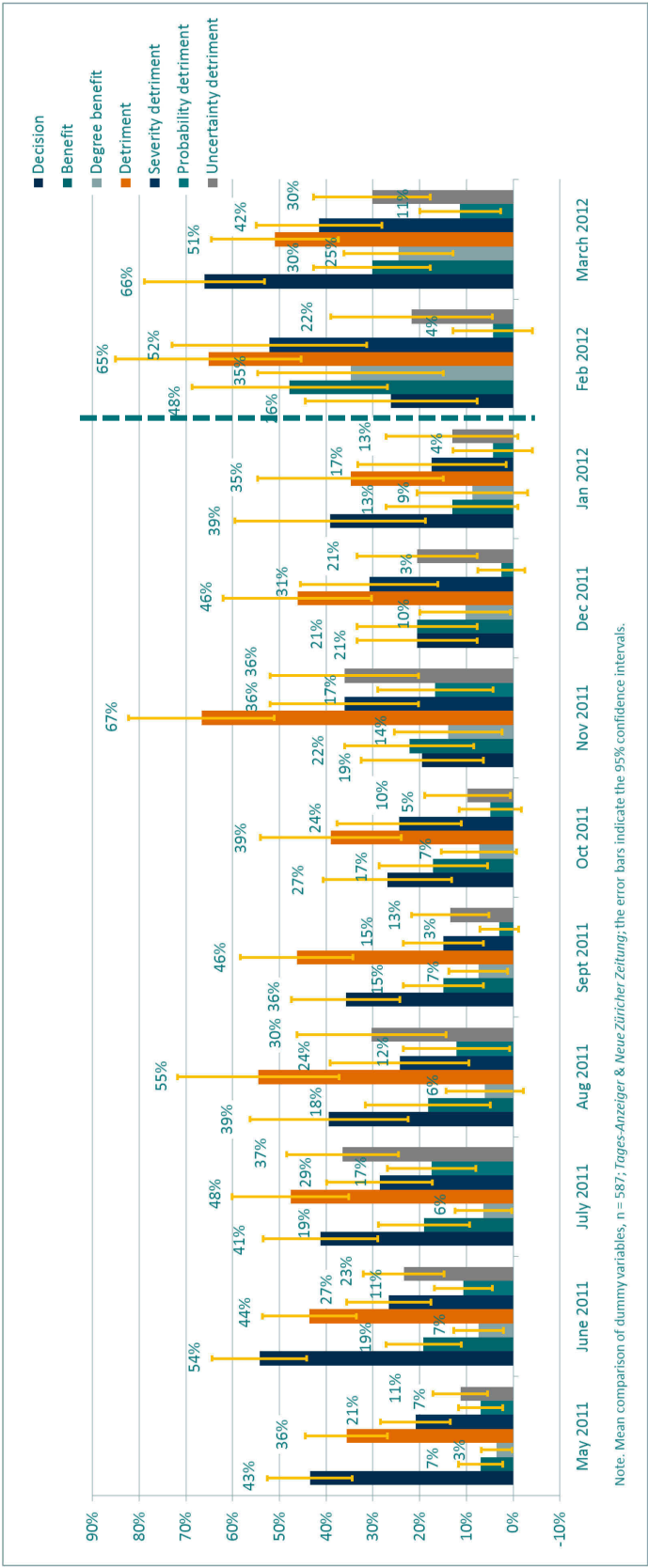


Figure 58 Risk dimensions phase three

When analyzing the data searching for a possible end of the third phase and a rise of the benefits, it seems as if something might change in February 2012. After the accident, and during the time May 2011 until the end of January 2012, benefits were given low media attention. However, in February 2012 this changes as the benefit focus peaks and reaches a similar level as the focus on the detriments. Also, the degree of benefits peaks during this month. The detriments are still getting more attention than the benefit, but the data seem to indicate a change in the way the benefits are covered, both in February and March 2012, especially if compared to the time from May 2011 until January 2012. Therefore, the third phase is considered to last from May 2011 until the end of January 2012. The rising attention to benefits and its degree during those two months are considered to be a sign of risk coverage changing after having had a strong focus on the detriments of Fukushima. Downs (1972) pointed out that the transition from the third to the fourth phase can be smooth. That strengthens the argument that the change in benefit focus observed in February 2012, which, compared to the previous phase changes might seem subtle, can be a sign strong enough for a phase transition. In addition, the fourth phase (see next chapter) was assumed to experience an attention upswing to the benefit dimension, such as the one identified here.

Turning to hypothesis ten, which assumed that the decision dimension would be clearly focused upon during the assumed phase of political deliberation, the data do not fully support it. The decision is the main focus, but together with the detriment and the detriment-associated dimensions. The attention to more or less all risk dimensions cannot be clearly proven, as the benefit is not much covered during the third phase. Some risk dimensions, as we have seen, are not covered much by the media at any time, including also not in this phase. This is foremost true for the probability and uncertainty regarding benefits. Therefore, the hypothesis is considered to be only partly validated, and the phase can be seen as still clearly influenced by the accident because of the still-strong focus on the detriment, even as high attention is given to the decision as well.

H10: In the phase of political deliberation, all risk dimensions will be discussed, but the decision will be the clear focus.

Further, in hypothesis eleven the third phase is assumed to be a window of opportunity defined by several factors. In order to identify if those factors are characterizing the third phase, comparisons will be drawn to the first phase, which can be considered the most neutral phase because it is not influenced by the Fukushima accident. At the same time as this comparison is made, the second phase will also be included in the figures.

H11: The window of opportunity is assumed to be further defined by:

- political topics and a nuclear phase-out,
- media attention on political actors and NGOs,
- a mostly negative bias,
- differences between media outlets regarding general bias, and
- declining media attention, albeit still more intense than before Fukushima.

Hypothesis eleven predicted political topics and the nuclear phase-out topic would be defining for the phase. Figure 59 gives an overview of topics in the media coverage, divided by the three first phases. Included are the two hypothesized topics: political topics across geographical areas and the nuclear phase-out topic. In addition, the three most commonly covered topics in general in 2011—considered a reference year—have been included. They are the Fukushima accident, Swiss energy policy, as well as risk and safety. To compare if nuclear phase-out is more covered than the topic of keeping nuclear energy, the latter has also been included in the figure. This results in a comparison of eight topics across the three first phases.

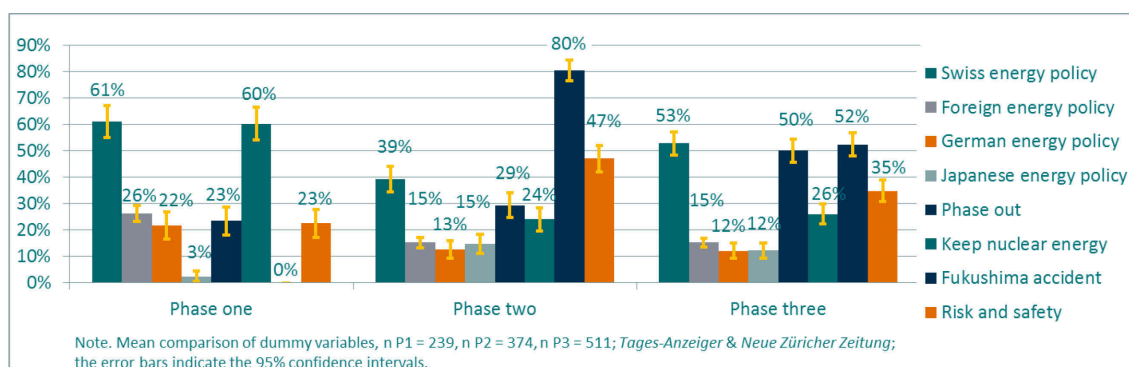


Figure 59 Topics across the three first phases

The data show that the third phase has a strong focus both on Swiss energy policy as well as the accident, with both topics being covered in every second article. As previously discussed, the focus on the accident itself has, however, significantly lost attention from the detriment coverage phase to the third phase. Swiss energy policy, however, has significantly gained attention compared to the second phase, reaching the same level as it had before the accident. Foreign and German energy policy lost significantly from the first to the third phase, but Japanese energy policy significantly gained. Risk and safety is significantly more often a topic in the third phase than in the first phase and significantly less a topic compared to the second phase. However, what can be seen as the

most defining topic of the third phase is the nuclear phase-out, which does not experience a significant shift between the first and the second phase, but which is significantly more discussed in the third phase. The topic of keeping nuclear energy dramatically loses attention in the third phase compared to the first phase. Hence, a characterization for the third phase regarding topics is that the nuclear phase-out topic is discussed in every second article and almost as often as both Swiss energy policy and the Fukushima accident. Interestingly, the option to keep nuclear energy is still mentioned in every fourth article during the third phase.

Hypothesis eleven further predicted that the third phase would be a window of opportunity for political actors as well as for NGOs. Figure 60 shows political actors, NGOs, as well as the second most cited actors in 2011 (again, considered to be a reference year), which were the nuclear operators. The data let one conclude that the third phase is not particularly defined by more politicians speaking compared to the first phase. Swiss politicians regain some of the attention they lost during the detriment coverage phase, foreign politicians lose significantly from the first to the third phase, and Japanese politicians gain significantly in the third phase compared to the first phase. Therefore, although politicians are the most cited actors, they do not distinguish the phase, at least not from the first phase. Both NGOs opposing nuclear energy as well as those in favor of the technology lose attention compared to the first phase, contradicting the hypothesized rise of NGOs. This result strengthens the argument that the first phase is a deliberation phase in which different actors—not only political actors—are cited, but the it weakens the hypothesis that assumed that the third phase would be a window of opportunity in which opposing and maybe also favoring NGO actors would have their say to a greater extent. Politicians and nuclear operators remain the most cited actors.

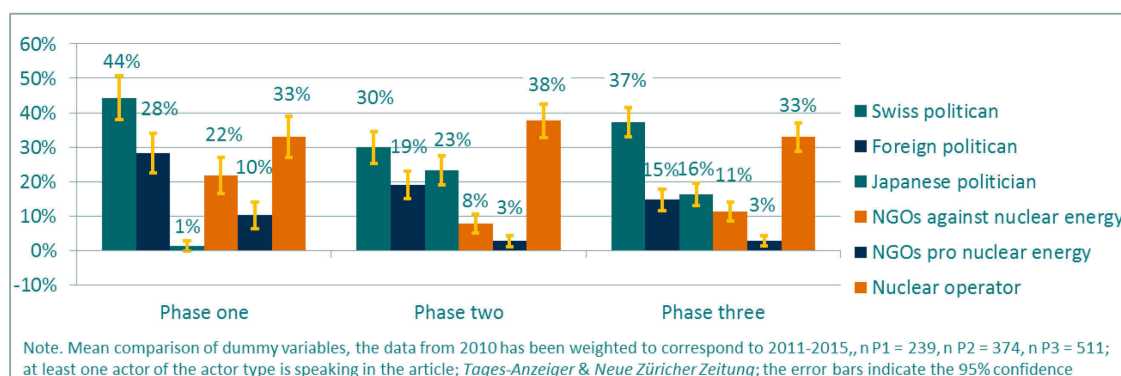


Figure 60 Selected actors across the first three phases

Turning to the bias of the coverage, nuclear energy is expected to be mostly negatively covered in the third phase, which the data confirm. The eleven hypothesis also expected this phase to show bias differences between the newspapers. The data do not, however,

support this assumption. *Tages-Anzeiger* is somewhat more negative than *NZZ*, but not significantly more. Both newspapers, however, show significantly less negativity compared to the detriment coverage phase (see Figure 61). This result contradicts the different bias Moser (2003) observed in *NZZ* and *Tages-Anzeiger* in 1986 to 1990, where his results showed a more negative bias in *NZZ* than in *Tages-Anzeiger* as the newspapers covered the accident in Chernobyl. Assuming that the bias measuring is comparable between Moser (2003) and this study, this result would indicate that the two newspapers have become more alike in their bias.

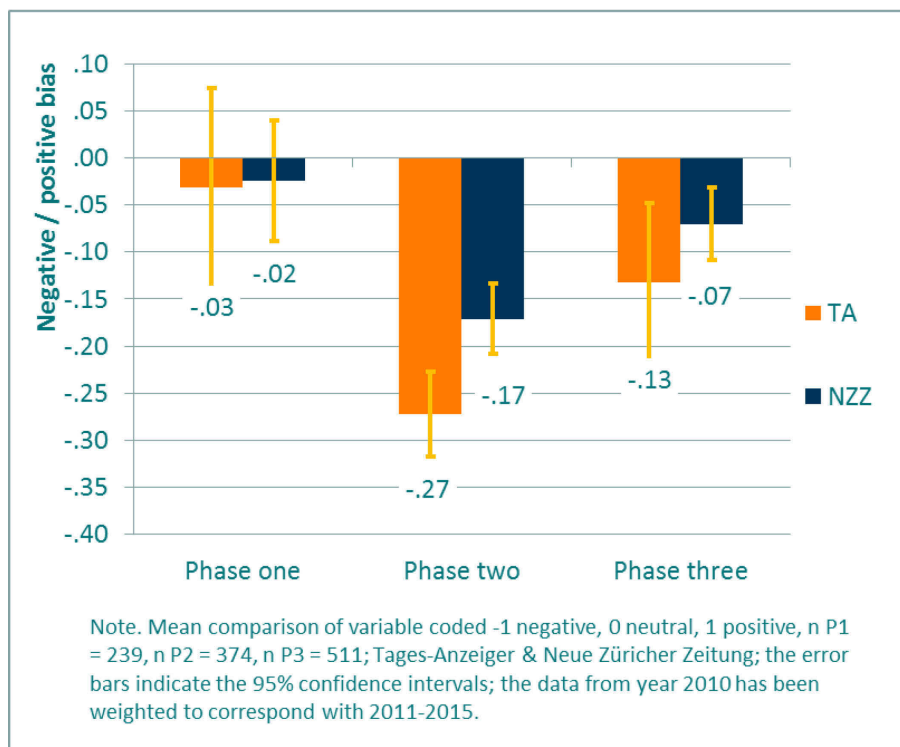


Figure 61 Journalistic bias in TA and NZZ across the first three phases

Finally, the third phase was expected to show a declining media attention to the nuclear energy issue, but that the issue would still gain more attention than before the accident. The amount of coverage is steadily decreasing during the third phase, but shows a couple of attention peaks. On average there are 57 articles per month in the third phase, compared to 249 in the second and 16 articles per month in the first phase. Thus, the third phase does give more attention to the nuclear issue compared to the first phase, and less attention than during the second phase. January 2012 is the first month that has fewer articles than the highest peak in 2010; therefore, attention could be considered as slowly returning to the level it was before Fukushima.

To sum up the results of the third phase, it can be said that it is a phase in which risk coverage focuses on detriment and decision dimensions and has a low amount of coverage on the benefits of the technology. Compared to the first phase, the lack of focus on the benefits is defining for this phase, as is the significantly less attention paid to the accident as compared to the second phase. The third phase is, however, still heavily influenced by the accident. The still-strong focus on the detriment shows this, as well as the news that keeps coming in from Japan reporting on the situation in the nuclear power plant.

However, with regard to whether this phase is a window of opportunity in which different actors can take advantage of the accident situation and push their own agendas, the results are somewhat ambivalent. Due to the lack of attention paid to the NGOs, of both factions, we can assume that they either do not get much media attention or they did not (yet) push their agendas during this time. Political actors did, however, regain some of the attention they lost during the detriment coverage phase, in the third phase. The situation that Fukushima created was one in which political actors opposing nuclear energy could push their agendas. The real-world decisions around the nuclear phase-out, and the media strongly reporting the topic of the nuclear phase-out, show that the window of opportunity was certainly there and utilized by political actors. In addition, this situation might be part of the explanation as to why NGOs either did not get much attention or were not pushing their agendas during this time. Since the Swiss parliament decided on a stepwise nuclear phase-out and this was heavily covered by the media, NGOs—especially those opposing nuclear energy—may have just found themselves with the stars aligned to let them „rest.“ The political leaders of the country were already rowing in their direction. As for the NGOs in favor of nuclear energy, even if they might have tried to get media attention, the fact that they didn't get much might just be explained by the fact that the general opinion climate may not have been optimal for pushing pro-nuclear arguments. Therefore, it could be assumed that the political decision to phase-out nuclear energy, in response to the not-long ago accident, created a situation in which nuclear-opposing NGOs did not have to act and nuclear-favoring NGOs could not act. Thus, had the Swiss parliament acted differently, or not acted at all, the situation that Fukushima created could possibly have been a window of opportunity, at least for nuclear-opposing NGOs. However, since Swiss politicians did act, this remains an unanswered question and only an assumption. On the other hand, for political actors already opposing nuclear energy, Fukushima did open the window of opportunity. For these political actors, who were in favor of a nuclear phase-out before Fukushima, the accident might have created an opinion climate convenient for actions in this direction.

With regard to the name of the third phase, since it did not prove to be as much a window of opportunity as assumed, it will instead be given the more suitable name *detriment deliberation*, as the detriments dimension continued to receive strong media attention, together with the decision risk dimension.

9.6.4. Phase Four – risk reconsideration

The political decision to phase-out nuclear energy was made very soon after Fukushima. Therefore, this study assumed that the decision might have been significantly influenced by the accident. As the accident becomes more distant in terms of time passed since its occurrence, this study also assumes that the decision might be reconsidered, similar to Downs' (1972) third phase in which the costs of the solution to the problem are realized. Therefore, hypothesis twelve predicted that the decision and detriment dimension would return to be the main focus of the risk coverage, after some time had passed since the accident. This however already happened in the previous phase three. The decision dimension returned to a similar level as before the accident and the detriment was also very much in focus.

H12: As the risk of nuclear energy is reconsidered, decision and detriment might return as the main focus, and benefit might experience an upswing.

What, however, distinguishes the fourth phase from the third is that the focus on the benefit rose significantly, as briefly discussed in the previous chapter. Therefore, the hypothesized benefit upswing is empirically observable and defines the beginning of the fourth phase. The attention directed to the benefits and the degree of benefits in February 2012 allow for the conclusion that enough time had passed since Fukushima, opening space for the benefits of the technology to be “remembered.”

However, what happens after February 2012 is somewhat unclear. This study has in detail analyzed all risk dimensions starting from February 2012, looking for a change of pattern, which would define the end of the fourth phase and the beginning of the fifth phase. Because the data is quite noisy, there does not seem to be a discoverable clear end in the analyzed time period. The unclear and noisy data is the reason why Figure 62 presents the data on a yearly basis and is divided per month or even quarterly. Leaving 2015 aside because of the low *n* of 43 articles analyzed this year, the dimensions' decision and detriment remain in sharp focus until the end of the sample period. The detailed analysis on a monthly basis, which has been conducted but is not depicted here, shows that there are shorter periods in which the dimensions' decision and detriment do experience fluctuation, but they always regain attention, and therefore do not indicate a

lasting change of pattern in the way media cover those risk dimensions. The same is true for the benefit. It is in general not as strongly focused as the decision and the detriment, but most of the time it is covered significantly more during those years than during the second and the third phase. The coverage of the benefits also experiences highs and lows, but without a clear rising or declining pattern over this time. As can be seen in Figure 62, the benefits seem somewhat less covered during 2013, but they regain attention in 2014. The severity of the detriment as well as the uncertainty regarding it are also dimensions that remain part of the risk coverage, but also does not allow drawing the conclusion of where the fourth phase might end.

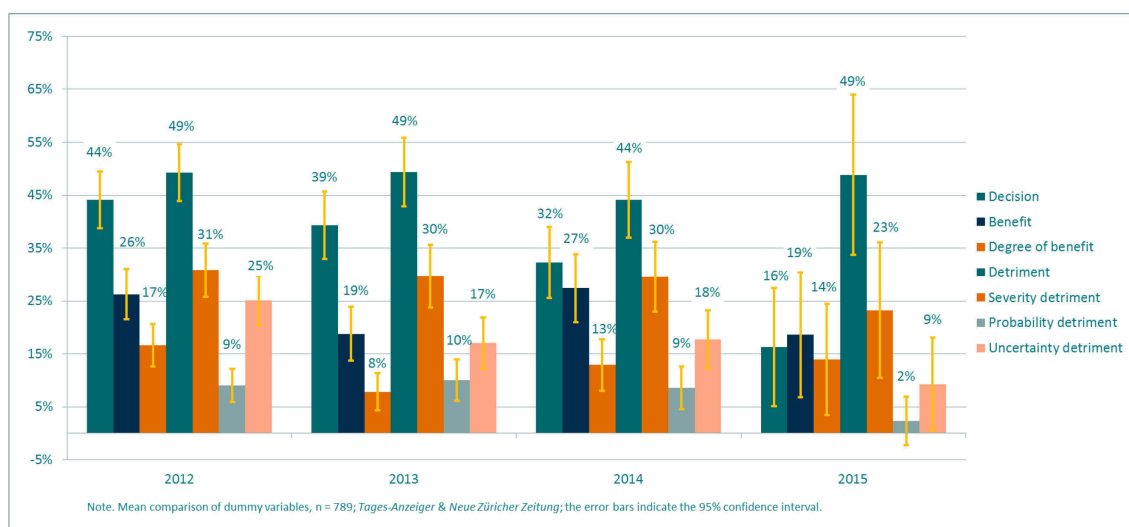


Figure 62 The most common risk dimensions phase four

The ups and downs during the period from 2012 to 2015, which is a rather long time period, call for a detailed analysis of this period to answer whether these years are actually one long phase or if there are risk attention cycles of their own during this time. To explore if this might be the case, the year 2013 has been selected for a more detailed analysis. 2013 was a year with several political nuclear energy events; it also contains a minor nuclear energy detriment, which might have triggered a similar phase pattern as did Fukushima. Therefore, 2013 is considered a year well suited for the analysis, whether shorter risk attention cycles appear during this time. What happened during 2013 was that in March the Federal Court decided against an initiative that wanted *Mühleberg's* run times to be restricted. This was an initiative submitted by Swiss citizens in February 2012. As can be seen in Figure 63, there was a peak of media coverage of nuclear energy in March 2013. In 2013, the two newspapers published the most articles during March 2013. Turning to the risk dimensions, as shown in Figure 64, March was the month with the most attention directed toward the decision and the detriment dimension. However, this is not defining for this month, as those two risk dimensions

are the two dimensions given the most attention, almost during the entire year and in none of the months was significantly more or less media attention given. What instead is unique for March 2013 regarding the risk dimensions is the total absence of benefit coverage. There are, however, other months during 2013 in which the benefits are also given very little media attention.

In April 2013, UREK (the Committees for the Environment, Spatial Planning and Energy) discussed the initiative by the Green party for pre-decided run times. Nevertheless, this political event did not trigger much media attention. Also, regarding the risk dimensions, April 2013 was not a particular month.

In September 2013, the Federal Council spoke against pre-decided run times and presented a counterproposal. There was slightly more media attention directed to nuclear energy in September, but no particular risk dimensions peaking significantly compared to the other months during 2013.

In October 2013, the nuclear operator *BKW* communicated that they will shut down *Mühleberg* in 2019 in any case. This event seems to have triggered some media attention and it was the month during 2013 in which the benefit dimension is covered the most (46%). This might be a sign of the media discussing the benefits of nuclear energy that are lost when *Mühleberg* is shut down. The benefits are covered significantly ($p < .05$) more in October 2013 compared to the months of March, April, July, and September of the same year. Together with the benefit coverage, the detriments and the decision dimensions are also much covered during October 2013.

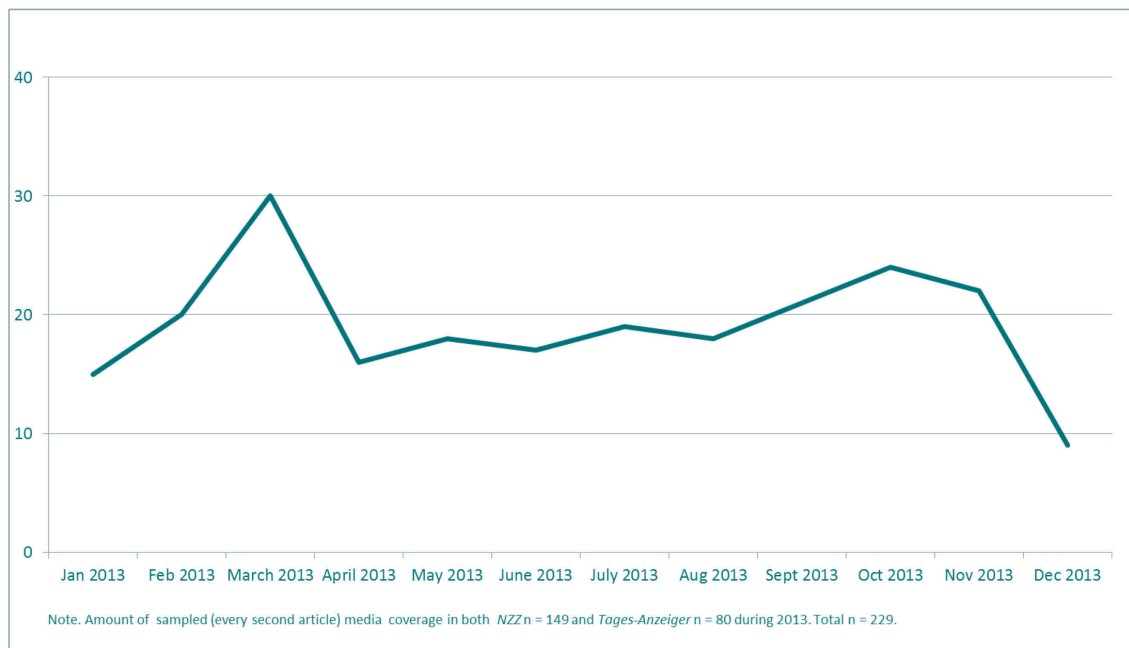


Figure 63 Amount of coverage during 2013

Other than those political milestones in 2013, the Swiss media covered a discovery of radioactive caesium in a Swiss lake called *Bielersee* in the middle of the bathing season, in July. The caesium had, however, already been discovered by geologists in 2010, but it was not until July 2013 that the discovery triggered some media fuss. Why the issue was covered three years after the discovery leaves room for speculation. The general opinion climate in 2013 might have been in favor of such a news story. Media might not have had much to cover during the summer news hole and since Fukushima was still in fresh memory by 2013, rather than in 2010, it might have been a favorable point in time for this story. This would fit with the previous studies that have observed similar events to be presented by the media, in a way that would make them seem more similar to the key event they relate to, than they might actually be in reality (Brosius & Eps, 1995; Esser, 2011; Fishman, 1978; Kepplinger & Habermeier, 1995; Rauchenzauner, 2008; Vasterman, 2005; Wien & Elmelund-Præstekær, 2009). However, it could also be that the story was actually only discovered by the media at this time. Looking at the amount of coverage, there is not really a peak observable in July 2013. Much more defining for this month is that the decision dimension reaches its lowest value during 2013; however, it's a value that is not significantly lower than in any of the other months in 2013⁶⁵. The detriment dimension is strongly covered, but not significantly more than in any other month during 2013.

⁶⁵ This was checked with a one-way ANOVA and a post-hoc Tukey test.

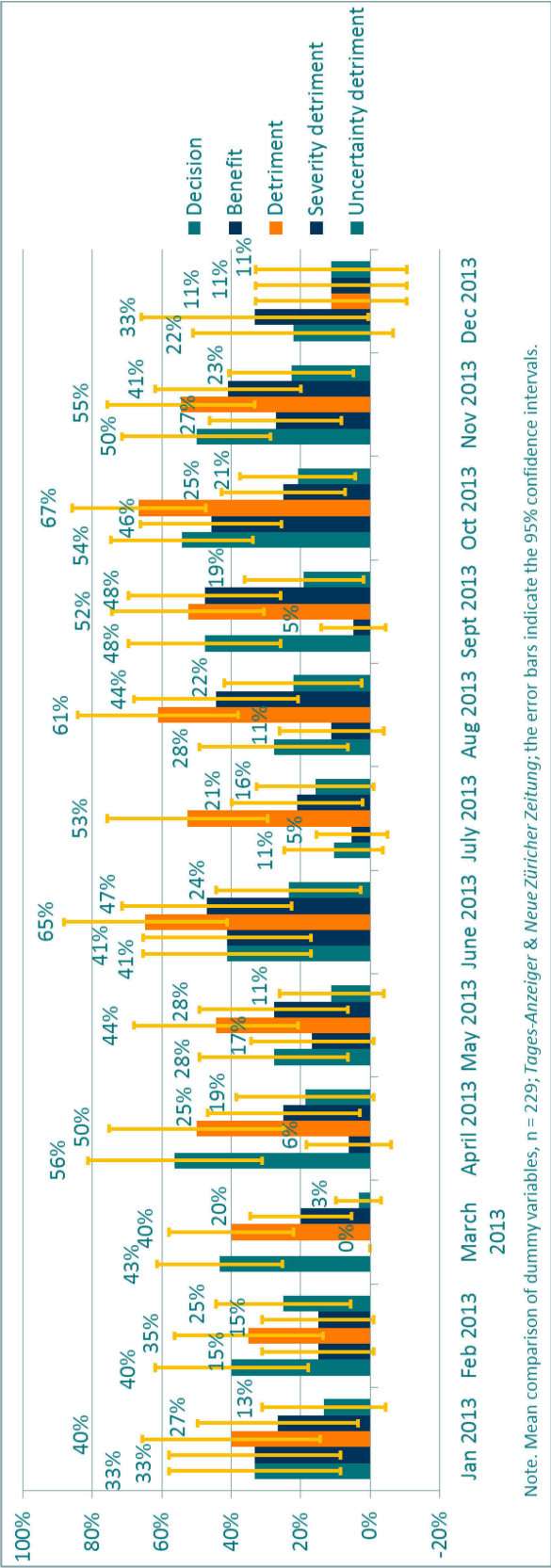


Figure 64 Risk dimensions 2013

To conclude this detailed analysis of the year 2013, if looking at the general pattern and ignoring if changes are significant or not, one could argue that in July 2013, a month with an actual (by the media's late discovery) detriment, most of the media attention was directed to the detriment dimension. The focus of the media however had already changed in the following month of August 2013. In August, the attention to the decision and the severity of the detriment rise, while focus is also kept on the detriment itself. In September 2013 the decision, the detriment and the severity of the detriment have more or less leveled out, receiving similar amount of media attention. In October 2013 the benefits regain attention. This pattern observed in the second half of 2013 is similar to the pattern seen over a longer time period after Fukushima. After Fukushima the detriment was in focus, like in June 2013, and the decision dimension received low media attention. A few weeks after Fukushima the decision dimension regained attention, similar to August 2013. Almost a year after Fukushima the benefits regained attention, in a similar way to how the benefits regain attention in October 2013. Although the general pattern is similar if looking only at the percentages, there are not many significant changes during 2013. A one-way ANOVA comparing the decision, the detriment, the severity and uncertainty of the detriment dimensions between the months in 2013 does not show any significant changes. The benefit is the only risk dimension that is due to some significant changes during 2013, as discussed above. The data cannot verify significant changes across 2013 and therefore also do not confirm a pattern of a "mini-phase" model. The year 2013, and the fourth phase in general, is much rather a phase of a few significant changes in the media focus to the risk dimensions. This result rather suggests this particularity of minor ups and downs to be actual characteristic for the fourth phase. Since the risk analysis of this study, which is already very detailed, cannot verify a pattern of a mini-phase model, one way to investigate this more carefully would be to conduct a qualitative analysis of all articles during a shorter period of time.

The up-and-down pattern, with very few significant changes, indicate what was hypothesized for this fourth phase, which was assumed to be a phase of reconsideration. The accident is increasingly distant; a political phase-out decision has been initiated; now it seems that this decision might be object of reconsideration. Looking at the risk dimension coverage over the years, as shown in Figure 62, seems to indicate this. If in addition considering the seesaw political decisions, and decisions taken by the industry, this pattern seems quite clear. The seesaw coverage of the risk dimensions seems to indicate indecisiveness, if not to say hesitation. However, these results cannot answer the question when the fourth phase might transition into the fifth phase. Since the fifth phase is assumed to be a phase of very low media attention, which will indicate a sort of "slumber" of the nuclear energy issue, the declining of media attention, to a lower level than in 2010, might be the sign to look for when determining when the fourth phase ends.

The amount of coverage is one part of the 13th hypothesis, which again will put the risk coverage in a context.

H13: The reconsideration phase is expected to focus on:

- policy topics and similar events;
- political actors and nuclear operators; and
- the sparse coverage will be rather neutral.

Hypothesis 13 assumes that the reconsideration phase will focus on policy topics as well as similar events, like other nuclear incidents. In Table 14 the four most commonly covered topics are shown across the years 2012 to 2015. Those are Swiss energy policy, the Fukushima accident, risk and safety, and the Swiss economy. Also included in the table is the topic of other nuclear accidents. This is not amongst the topics focused upon the most. However, 2014 is the year in which other nuclear accidents are covered the most in the whole sample period from 2010 to 2015. Only in 2010 were other nuclear incidents also covered in a similar number of articles (16%). The topics of the nuclear energy coverage show that the issue is still a political one. As the media attention to Fukushima decreases, the media seem to rather focus on the Swiss economy when covering nuclear energy. The rather low focus on other nuclear accidents and incidents might just be explained by the fact that there might not have been so many similar events to report on. Therefore, based on this data, hypothesis 13 regarding the topics of the articles in phase four can only be validated with some caution.

Table 14 Topics phase four

Topic	2012	2013	2014	2015
<i>All numbers are percentages</i>	n = 331	n = 229	n = 186	n = 43
Swiss energy policy	52	66	69	77
Fukushima accident	42	34	27	23
Risk and safety	34	41	42	35
Swiss economy	24	39	32	33
Other nuclear accidents	10	10	17	7

Note. The three most mentioned topics per year are written in bold numbers.

Several topics could be coded per article.

The 95 percent confidence intervals for those values can be seen in the figure in Attachment A.

Regarding the actors speaking in this phase, it was assumed that politicians and nuclear operators would be the most commonly cited by the media. As was shown in chapter 9.2.2 Swiss politicians and nuclear operators are the actors cited the most in 2012 to

2015. Regarding the many political and industrial decisions and discussions made during those years, this result makes sense.

The tone of the coverage was assumed to be rather neutral during the fourth phase. This was however not the case. The year 2013 had a strong negative bias as in the accident year of 2011. However, 2014 was then significantly less negatively biased and was quite close to being neutral, as can be seen in chapter 9.2.4.

Regarding the amount of coverage, as was mentioned previously, the decreasing amount of media attention given to the issue of nuclear energy might be the most relevant sign for the fourth phase to end and the fifth phase of a “slumber” to start. As Graf concluded, the interest of the media and the public seems to fade as soon as important political decisions have been made (Graf, 2003, p. 133). During the years 2012 to 2015 several political decisions had been made. Only in the winter session of 2014 (November, December 2014) the Swiss parliament discussed its “energy strategy 2050” and also the future of nuclear energy. As of today (autumn 2015), no final decision regarding the nuclear energy plants has been taken in Switzerland; the “important decision” that Graf (2003) spoke about, might not yet have been made. Potentially, the decision will abide so long that the public attention fades before the decision has been taken. These are however only speculations. An analysis reaching further than March 2015 would have to verify this. As for this study, and the question of if the media attention to nuclear energy is decreasing to a degree that would indicate a slumber of the issue, a closer look will be taken on the average amount of newspaper articles during the months in 2012 to 2015. As previously mentioned, it is not sure that the fifth phase occurs in the sample of this study.

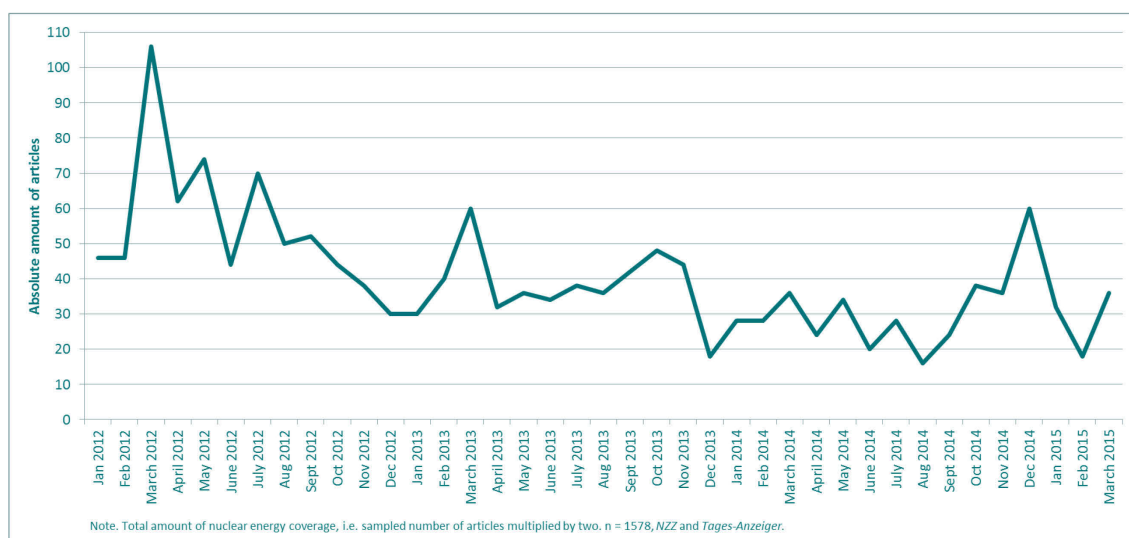


Figure 65 Total amount of nuclear energy coverage in NZZ and TA 2012 to 2015

Figure 65 shows the total amount (not only the sampled amount) of nuclear energy articles in the two analyzed newspapers *NZZ* and *Tages-Anzeiger*. The average number of articles during the years 2012 to 2015 are 40 articles per month. The data show that October 2012 is the first month to reach the average amount of 40 articles. However, their attention peaks again around the anniversary of the accident in 2013 and also in October 2013. After November 2013 it seems as if the attention steadily decreases. August 2014 showed the lowest number of related articles published (16 articles). This low number of articles was observed twice in 2010: in January and July 2010. August 2014 was the first month since July 2010 to have that low of nuclear energy coverage. However, triggered by the winter session of the Swiss parliament, in which nuclear energy is one important topic discussed, the media attention to nuclear energy again rises above the average number of articles during those years and reaches 60 articles in December 2014. That is on average one article per day in each newspaper during December. After that it seems the media attention decreases again. The anniversary of Fukushima in March 2015 might trigger the attention to rise, but what happens after that is beyond this study. This data does however not indicate a phase of slumber taking place or starting during the analyzed years. Regarding the coverage of the risk dimensions, the data also suggest that during the whole time the risk dimensions more or less are part of the nuclear energy coverage. The analysis would capture if those dimensions were not mentioned in the media coverage anymore, but they remain a part of the coverage.

The three years of 2012 to 2014, and the beginning of 2015 seem to be a reconsidering phase altogether, in which the two fractions, pro and con, push their agendas on different levels in the political and societal system.

9.6.5. *Phase Five – slumber*

The fifth and last phase of the suggested risk attention phase model was assumed to be a phase of very low media attention. The few articles during this time were predicted to focus on the decision dimension (hypothesis 14), regarding the risk coverage, until a “final” decision has been taken on how the nuclear energy future in Switzerland will look after Fukushima.

H14: Until a final decision is taken on the nuclear risk, decision will be the risk dimension that attracts the most media focus.

However, as the data showed in the previous chapter, such low attention to the nuclear issue was not reached during the analyzed years of this study.

H15: This predicted phase of very low media attention:

- will focus on policy and potentially similar events;
- including political actors and nuclear operators; and
- will be characterized by neutral media coverage.

Therefore, neither the 14th nor the 15th hypothesis can be answered in this study. Certainly the cut-off in March 2015 awakens curiosity. At least one is eager to know if the peak in amount of coverage visible in the data of this study in March 2015, is just due to the accident anniversary and if the media attention might drop off after March 2015. A search for articles, using the same keywords as initially done in this study, in the data-bank *Factiva* has been conducted in order to at least answer the question of if the issue of nuclear energy goes dormant and falls asleep after the fourth accident anniversary. In order to account for the sampling strategy utilized in this study, which excluded short articles, readers' letters and articles that falsely were in the sample due to the broad set of used keywords, accounting for 60 percent of the articles found in *Factiva* using the same keywords, have been excluded. The exclusion percentage was accounted for by calculating the average number of articles excluded in January, February, and March 2015. By doing this, the extrapolated number of articles for the months following March 2015 shows that the slumber does not yet occur until the end of August 2015, as can be seen in Table 15.

Table 15 Number of articles April to August, 2015

Month	Number of articles
April 2015	33
May 2015	18
June 2015	26
July 2015	33
August 2015	35

Note. The numbers account for 40 percent of the articles found in *Factiva* using the same keywords as this study initially did, and the newspapers *NZZ* and *Tages-Anzeiger*. In total, 60 percent of the articles were excluded, because that approximately corresponds to the percentage of articles that were sampled during January, February, and March 2015.

9.6.6. Multinomial logistic regression

Having seen the different phases that can be identified in the risk coverage in the two analyzed Swiss newspapers, before and after a severe detriment, this section sets out to discriminate the phases further. Beyond the hypotheses that already investigated variables other than the risk dimensions and thereby put the risk coverage into context, the

influence of further topics and actors shall be analyzed in this section. This analysis will add to the risk attention phase model by detecting which topics and actors distinguish the phases beyond the risk dimensions, and in addition to the specific topic and actors already studied in the hypotheses. In order to do this a multinomial logistic regression will be used, because by using this analysis method it can be observed how likely it is for variables to occur in one of the phases compared to a defined other phase. The reference category for the multinomial logistic regression has been set to be the first phase, as it is considered to be the most neutral phase and the closest this study gets to referring to a routine phase of nuclear energy risk coverage. In Table 16 the result of the multinomial logistic regression can be seen, and the model has a pseudo R^2 after Nagelkerke of .42. That means the model is able to explain 42 percent of the variance, which is considered to be a value middle-rate to good value for this particular model. As can be seen in Table 16, what discriminates the second phase from the first phase under the stabilization of the independent variables in the model (regarding the topics and the actors in the media coverage), is significantly more coverage of the Fukushima accident, the natural catastrophes triggering it, and risk and safety. This result is not surprising. More interesting is that Japanese energy policy is covered significantly less in the second phase than in the first phase, as is also the topic of climate change or climate protection. This result suggests that there are other variables that are stronger in discriminating between the first and the second phase, which is most likely the topic of the accident. The topic of climate change or protection is significantly less prone to being covered in the second phase than in the first phase. This seems logical since the accident was the largest issue during this phase. Energy authorities are more likely to be cited in the second phase than in the first phase, but civilians, nuclear opposing actors, and actors from the energy industry are less likely to speak in the media coverage in the second phase. Energy authorities are important actors in the second phase compared to the first phase, as they might have important information to communicate in this uncertain phase. Instead, the energy industry is not a popular actor for the media to cite, compared to the first phase, and are also not, somewhat surprisingly, nuclear opposing actors. Those results, as well as civilians not giving much attention, seem to strengthen the notion that it is a phase where foremost the accident and actors potentially giving neutral information about this subject, are common topics and issues.

Table 16 Multinomial logistic regression

Reference category is phase one						
Variable	Phase two		Phase three		Phase four	
	Exp (B)	Sign.	Exp (B)	Sign.	Exp (B)	Sign.
Topics						
Swiss energy policy					2.624	.001
Fukushima accident	1214536009.1	<.001	355270952.4	<.001	164683595.8	<.001
Risk and safety	1.854	.010			1.664	.014
Swiss economy						
Foreign energy policy						
Science and technology			2.865	<.001		
Natural catastrophes 11.3.11	37552826.5	<.001	21913998.1	<.001	10691419.8	<.001
Japanese energy policy	.141	.022				
Other nuclear accidents			.428	.003		
German energy policy					.399	.002
Climate change or protection	.437	.018			.367	<.001
Japanese economy						
Foreign economy						
German economy						
Actors						
Swiss politicians					.632	.042
Nuclear operators			.634	.026		
Energy authorities	1.756	.038			1.956	.003
Civilians	.567	.021	.369	<.001	.426	<.001
Foreign politicians						
International organizations						
Japanese politicians					7.258	.044
Nuclear opposing actors	.365	.001	.500	.005	.611	.025
Energy industry	.409	.008				
Science & Experts						
Industry						
Nuclear favoring actors			.403	.019	.320	.001

Note. Empty cells did not show any significance result ($p = .05$)

Pseudo R^2 Nagelkerke = .42

In the third phase, the detriment deliberation phase, the accident and the natural catastrophes are still, of course, covered more often than in the first phase. Interestingly, the topics of science and technology are significantly covered more at this point in time, when compared to the first phase. This might be a sign of orientation, which could very well be needed after such shock that Fukushima provided. After the detriment coverage of the second phase, the detriment deliberation phase is given more extensive focus to the science behind the technology, compared to the first phase. As the benefits were more significantly covered in the first phase than in the third phase, this result indicates that when media cover the benefits of nuclear energy, science, and technology is less covered as when the (actual) detriments are getting most of the attention. Slightly puzzling is the result that shows that the coverage of other nuclear energy accidents are covered less than in the first phase. This contradicts the results of previous studies (Brosius & Eps, 1995; Fishman, 1978; Kepplinger, 1988; Kepplinger & Hartung, 1995;

Vasterman, 2005). However, this might simply indicate that still so shortly after Fukushima, there was no room for the coverage of similar events. Already looking to the fourth phase, regarding the topic of other accidents, the data show that this is not a topic that distinguishes the fourth phase from the first phase. This might imply that other accidents are covered to similar amounts in the first and the fourth phases, since it is not a variable that distinguishes the fourth from the first phases, or also that the variable is not a strong predictor for the discrimination between the first and the fourth phases. Regarding actors that distinguish the coverage in the third phase from the first phase, is that nuclear operators, civilians—both nuclear opposing and favoring actors—are cited less in the third phase compared to the first phase. Less focus is given to nuclear operators in the third phase, which distinguish it from the first phase, however, neither the second nor the fourth phase are distinguished from the first phase regarding nuclear operators. This result might imply that during the detriment deliberation there is less room for this rather industrial actor with economic interests. That nuclear operators are covered more in the first phase, considering the building plans, is not surprising. In the second phase nuclear operators might however have taken a different role, namely informing upon the accident. In the fourth phase they might have returned with their economic interests, or might even have taken on both roles: as informants and economical actors.

In the fourth phase, interestingly, the Swiss energy policy is covered even more than in the first phase, which supports this phase being defined as a risk reconsideration phase, in which (new) energy policy strategies are a relevant issue. Risk and safety is also significantly more focused in the fourth phase's coverage, as well as of course the accident and the natural catastrophes. German energy policy is covered less than in the first phase, which might indicate that Switzerland is less orientating towards Germany's energy policy in this important phase. Also highly interesting is that the topic of climate change and climate protection is covered significantly less in the fourth phase compared to the first phase. This might imply that as the risk is reconsidered, the climate friendliness of the technology does not seem to be as much in focus as the topic was before Fukushima. This would imply, that one of the clear benefits of nuclear energy is not a part of the risk reconsideration, which is of course one of the main arguments in favor of the technology. Turning to the actors distinguishing the fourth phase from the first, the data show that energy authorities and Japanese politicians are covered significantly more than in the first phase. This might just be a sign of the changed focus that Fukushima triggered. Nuclear opposing and nuclear favoring actors are still covered less than in the first phase. As discussed previously, this might indicate that the opponents feel there is no "need" to act and try to get attention, compared to the first phase in which the situation was much more open and uncertain regarding the future of nuclear energy. Nuclear favoring actors might still in the fourth phase just not have had much chance to

place their interests. The result that Swiss politicians are less cited in the fourth phase compared to the first phase, which was not the case in phases two and three, might be a sign of the election year 2011 being passed and the initial important statements, after the accident, not being newsworthy to the same degree as the politicians were important to the coverage in the first phase, in which they had interest to communicate. The civilians are again covered significantly less than in the first phase. This result is somewhat ambivalent, because it could be assumed that affected people in the Fukushima region could be cited after the accident. As they seem not to be causing as much attention, in order to distinguish all phases from the first phase, it could be assumed that the Japanese civilians were too far away and might not speak English to an extent that would make the journalists prone to contact them to a large degree.

9.7. Interim conclusion – phase analysis

This study set out to determine how media depict risk and its dimensions over time, investigating if there is a phase pattern to media risk coverage. After having seen that the two analyzed Swiss newspaper do, more or less, report the risk dimensions defined in this study, the fourth research question asked if the way media depict risk form a phase pattern in the coverage.

4. Does media depiction of risk form a phase pattern?

In the previous sections the risk dimensions have been analyzed in detail over time to identify changes in the media focus to different risk dimensions; these included changes that would indicate risk coverage alternating enough to identify different phases.

Based on the knowledge from previous studies analyzing phase patterns in media coverage, a tentative risk attention phase model was included in chapter 7.1. and several hypotheses were posited. Some of these could be supported by the data, and some of could not or were only partly supported. The fact that not all hypotheses could be supported is one indication of the particularity of this study. To my best knowledge, no study before this one has utilized such a broad risk definition, extracting risk dimensions, which can be empirically measured, or one that has conducted content analysis over such a long span of time. Most studies assessing risk coverage focus on short periods of time, often the time around a negative incidence regarding the risk, and in addition most studies analyzing risk coverage use quite a superficial risk definition, some without much information about what has been measured empirically. This study not only took on this research gap, which has left researchers unknowing of how media de-

pict risk in all of its aspects, but it also used this detailed risk dimension analysis to create new knowledge about if, and if yes, *how* media depict risk over time.

The results of this research support the idea that risk is covered in a phase pattern. The data indicates significant changes over time. The focused risk dimensions, together with contextual factors in the media coverage, as well as the real world context, have enabled the identification of four risk attention phases across 2010 to 2015. Chapter 7.1 gave a tabular overview of the assumed characteristics of the hypothesized phases. This table has been revised due to the findings of this study and is presented in Table 17.

As can be seen in Table 17 and in Figure 66 (defining the four phases regarding risk coverage), is that in the first phase, before Fukushima, the decision, the detriments, and the benefit regarding nuclear energy are the risk dimensions that media focus on the most. Therefore, this phase has been given the name *prospective risk deliberation*. Both the negative and the positive side, together with the risk decision were discussed before the accident happened. Thereby, the main topics of the media coverage were energy policy and the economy. In this discussion, politicians and nuclear operators were the actors that are most cited in the Swiss media nuclear energy coverage. The data does not show the assumed positive bias in the coverage; instead the articles are more or less neutral in tone, and in addition, there is only little controversy presented. The amount of coverage is low, but clearly this shows that the issue did trigger attention already, before Fukushima, as in an average of 17 articles were published per month.

Table 17 Characteristics of the Risk Phases

Phase	Duration	Risk Dimensions	Topics	Actors	General Media Presentation	Amount of Media Coverage
Prospective risk deliberation	January 1, 2010 – March 10, 2011	- Decision - Detriment - Benefit	- Policy - Economy	- Political - Nuclear operators	- No bias - Uncontrover-sial	Sparse, 17 art./mo.
Detriment coverage	March 11, 2011 – April 30, 2011	- Detriment - Severity - Uncertainty	- Accident	- Political - Nuclear operators (- Experts & scientists)	Negative	Very high, 250 art./mo.
Detriment deliberation	May 1, 2011 – January 31, 2012	- Detriment - Decision - Severity - Detriment uncertainty	- Policy - Accident - Risk & safety - Nuclear phaseout	- Political - Nuclear operators	Negative	Mid, 60 art./mo.
Risk reconsideration	February 1, 2012 – March 31, 2015	- Detriment - Decision - Severity - Benefit	- Policy - Risk & safety - Swiss economy - Accident (- Other accidents)	- Political - Nuclear operators	Negative	- Sparse, 20 art./mo. - High peaks
Slumber	?					<i>Very sparse, or lower than before Fukushima</i>

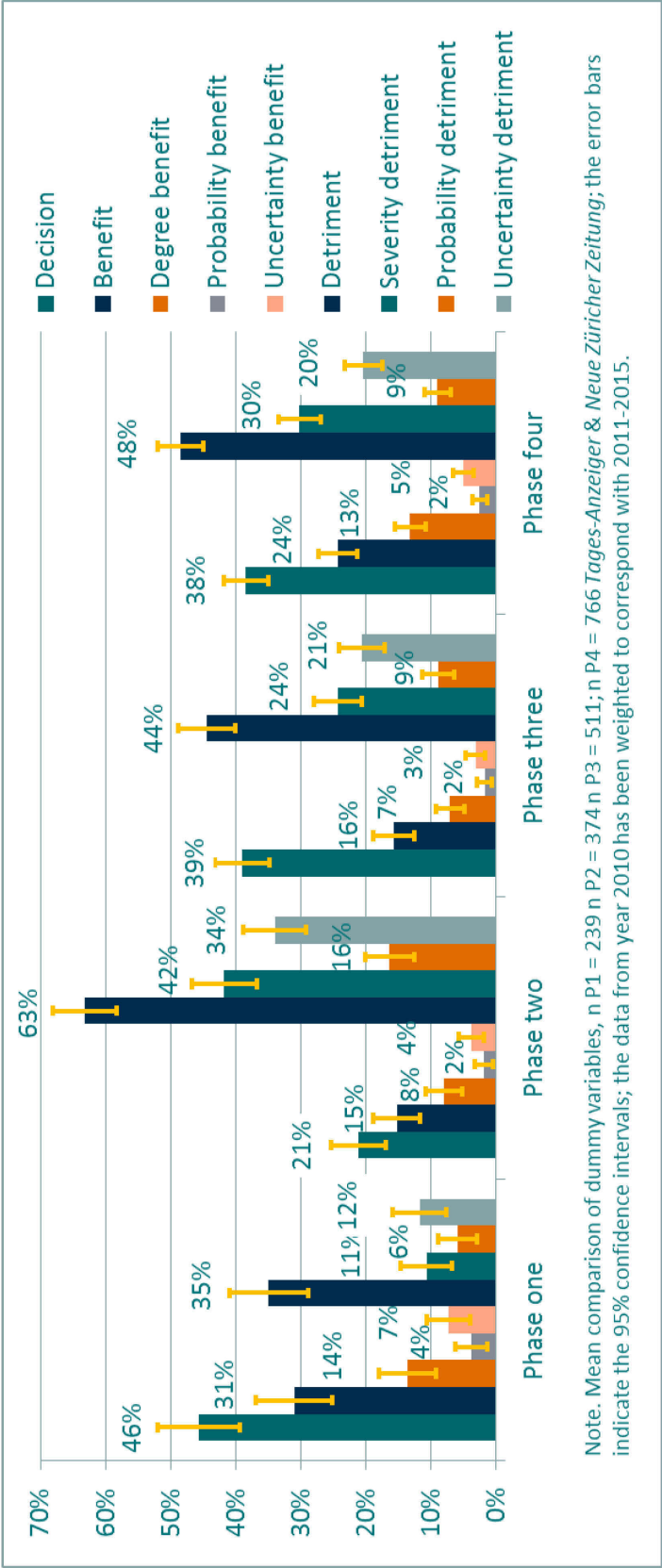


Figure 66 All risk dimensions across the four phases

The second phase is clearly defined by the Fukushima accident. The risk dimensions that are mostly in focus in the media coverage are the detriments the accident caused, their severity, and the uncertainty regarding those. The topic in those articles is the accident itself. The main actors in the media coverage remain the politicians and nuclear operators, as in the first phase. Experts and scientists do get cited a bit more often than otherwise, but not significantly more. The accident triggered negatively biased media coverage of nuclear energy, and regarding the amount of coverage, the attention was extremely heightened as nuclear energy was covered in up to, on average, 250 articles per month, in just one newspaper. The amount of coverage is however concentrated around the accident and does steadily decrease after this peak. Because of this strong focus on the accident and its detriments, this phase was termed *detriment coverage*.

The third phase is defined by the decision dimension regaining attention, while, however, still strong emphasis is put on the detrimental side of the technology. Because of this and because of the topic's policy, nuclear energy phase-out, and the accident itself being mainly discussed by the actors, politicians, and nuclear operators, this phase is considered a *detriment deliberation* phase. This indicates the immediate effect Fukushima had on the nuclear energy issue. After the media's heavy focus on the detriments, the accident eventually also triggered deliberation, which was depicted by the media, as well as the politicians to take the first steps and decisions towards a nuclear phase-out in Switzerland. The tone of the coverage in the third phase was still rather negative. The amount of coverage, however, reduced to, on average, 60 articles per month during the nine months of the third phase.

The fourth phase is called *risk reconsideration* because it is the point in time where the benefits of the technology regain some media focus after having had low attention during the second and the third phase. The benefits are, however, still covered significantly less than before the accident, but they have, compared to the two previous phases, significantly won media attention⁶⁶. During the fourth phase the accident slowly disappears out of the media focus and other topics, like the Swiss economy, regained attention. The main actors cited remain the same and again, during this phase, those are politicians and nuclear operators. The bias of the coverage is due to fluctuation during this phase, which is an additional sign for the phase being a reconsidering phase. The fluctuation can be observed by comparing the years. In 2013 the negative bias is somewhat stronger than in 2012 and 2014. In 2014 the bias is closer to being neutral than in both 2012 and 2013. The amount of coverage reaches similar levels to before the accident, but it does not go below the amount of attention that nuclear energy received before Fukushima

⁶⁶ This has been controlled with a one-way ANOVA using the post-hoc Tukey test, $p < .05$.

happened. This, together with the fact that the risk dimensions remain part of media's nuclear energy coverage are the two main reasons why this study does not consider the fifth assumed phase of *slumber* to occur in the analyzed time period. Figure 67 shows the average amount of coverage in the two newspapers across the phases to visualize the observation that the average amount of coverage in phase four is very close to the amount of coverage before Fukushima. After the peak of attention triggered by Fukushima, it was first in January 2012 that the amount of coverage reached similar levels to before the accident again. However, the amount of coverage did not stay on this rather low level after January 2012. It peaked several times after that, and as previously mentioned, it was first in August 2014 that the amount of coverage for the first time after the accident reached an as-low number of articles as in the month with the lowest attention before the accident. Although, also after August 2014 the issue regained attention. During the parliament winter session in 2014 the attention to the nuclear energy issue rose again.

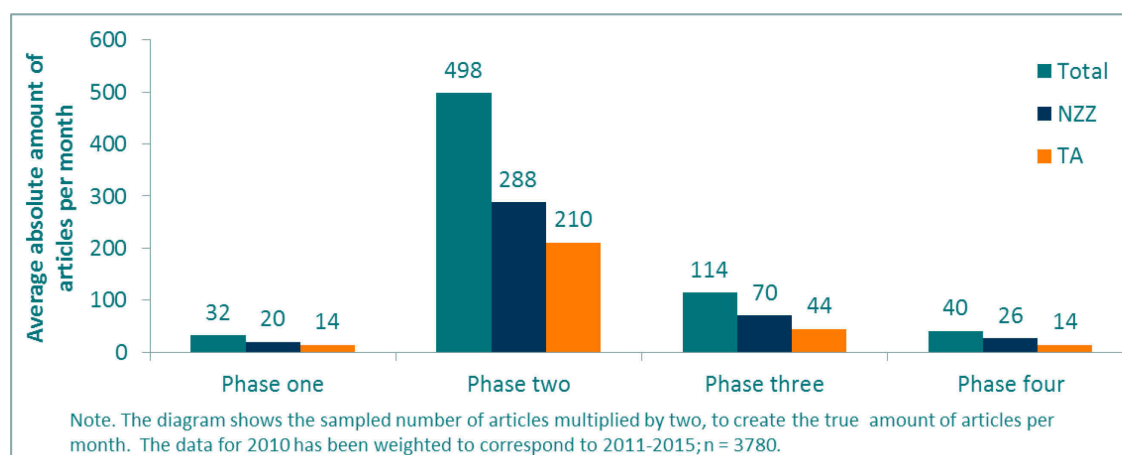


Figure 67 Amount of coverage across the phases

Turning to the results of Graf's (2003) study on Swiss nuclear energy coverage during 1969 to 1985, she implied, as the three newspapers she studied published on average of 500 articles per year, that the issue was covered intensively. The observed amount of coverage in phase one does reach that number. Therefore, by looking back at the amount of coverage in the past, this number of articles has not only been observed previously, but is also by other researchers thought to be a sign of intense coverage. During the time period after Chernobyl, the attention even rose. In Moser's (2003) study of the years 1986 to 1990, analyzing the same newspapers as Graf did, there was on average of almost 900 related articles on the topic published per year. Those articles were of course not evenly distributed across the years that Moser studied, but show a very similar

pattern to the one observed in this study, with heavy media coverage after the Chernobyl accident, which then slowly decreases and peaks several times after that.

The multinomial logistic regression provided further knowledge about which topics and actors were able to discriminate phase two, three, and four from the first phase. This summary will only discuss some of the most interesting results. Strengthening the argumentation of the fourth phase being a reconsideration phase, was the result that Swiss energy policy discriminated the fourth phase compared to the first phase. In the fourth phase this topic was mentioned more than twice as often as in the first phase. The data shows that scientific and technological topics were covered more in the third phase of detriment deliberation, than in the first phase. This shows that the third phase might need more scientific guidance about nuclear energy than was considered to be needed in the first phase. So even if the descriptive results did not show a clearly stronger focus of this issue, the multinomial logistic regression is able to show that it does discriminate the third phase from the first phase. There are two somewhat puzzling results. One is the lesser focus on civilians in all three phases after Fukushima compared to before the accident, and the second is that nuclear opposing actors are also mentioned less in those phases compared to the first phase. It does need some speculation to make sense of those results. Nuclear opposing actors could have, as mentioned previously, “relaxed” somewhat when seeing that the political system was going in their desired direction, namely towards a nuclear energy phase-out. This might have been different in the more open outcome situation before Fukushima. The less cited civilians after the accident compared to before the accident might have to do with more civilian voices being cited before Fukushima in reference to the upcoming decision on new nuclear power plant licenses. One result that goes against previous studies (Brosius & Eps, 1995; Fishman, 1978; Kepplinger, 1988; Kepplinger & Hartung, 1995; Vasterman, 2005) is that the mentioning of similar accidents does not discriminate among the phases after Fukushima compared to before the accident. It is even the case that they are covered less in the third phase than they are in the first phase.

Referring to Downs (1972) and Luhmann and the “theme careers” (1971, p. 18) discussion, do the results of this study indicate such careers for risk? The data do clearly show different points in time, in which different risk dimensions get more attention. The fluctuation in the amount of attention that is given by the media to the different risk dimensions can be used to divide the media coverage into phases. What is important to state is that the phases and the media coverage, at least in this case, are not independent of real world events. Factors beyond the Fukushima accident, for example political decisions and processes, can contribute to media attention phases. As Downs (1972) argued, environmental issues caused attention peaks without anything in the environment itself

really changing. This is not, or only partly true for risk coverage. Risk coverage, especially detriment coverage, is not independent of a real detriment happening. Smaller detriments however, like the discussed issue around *Bielersee*, do not trigger an attention peak as Fukushima did. This shows, there are of course a differentiation to be made between the severity of the accidents and the amount of media coverage they trigger. On the other hand, however, as the benefits gained attention again eventually after the accident, the attention directed to this risk dimension was not triggered by a new situation regarding the benefits of nuclear energy. The benefits of nuclear energy are the same over time. However, if the context changes, such as if there is more of a focus on climate change and CO₂ emission, then the focus to the benefits of the technology can change and might rise. Or course there could also be events regarding the benefits, which would create a “new” situation, as for example with new ways of building nuclear energy plants. Therefore, one could partly argue as Downs (1972) did, that nothing changed regarding the benefits, but the media coverage did, likely along with the societal discussion, as the benefits regained attention. Clearly however, Fukushima let the first phase transit to the second phase, this being an actual change and a phase change trigger.

As referring to Downs (1972), it shall be noted that the phases found in this study and Downs’ phases are a bit different. His phases are:

1. The pre-problem stage
2. The alarmed discovery and euphoric enthusiasm stage
3. The stage of realizing the cost of significant progress
4. The stage of gradual decline of intense public interest
5. And the post-problem stage

In the case of risk coverage that includes a severe accident, the data of this study indicate that there is a phase in-between Downs’ first and second phase, which is the accident phase, called the *detriment coverage phase*. The second phase of Downs’, which is considered to be the third phase in this study, is the *detriment deliberation phase*, because the third phase of this study does still show alarm triggered by the accident. In addition, considering the political phase-out decisions that were taken during this phase (May, June, and September), this can be considered similar to what Downs would call the euphoric stage, in which one thinks to be able to solve the problem. Downs’ following third phase in which the costs are realized is here considered to be the fourth phase of *risk reconsideration*, in which the costs of a nuclear phase-out are realized and the attention is again somewhat directed to the benefit of the technique. Nevertheless, just because the benefits are recalled upon, does not mean that the already taken decisions

can be reversed from one day to another. Peters and Hogwood, analysing the policy cycle, point out that if the issue has already entered into the policy arena, which it did in Switzerland shortly upon Fukushima, the issue cannot “automatically self-destruct when costs become apparent or interest declines” (Peters & Hogwood, 1985, p. 239). As the data showed, this was the case for this issue as well. With the political decisions taken shortly upon Fukushima, the issue entered into the policy cycle (Jarren & Donges, 2011) and as can be seen by, for example, the discussion in the winter session of the Swiss parliament in late 2014, nuclear energy was still an issue on the one hand causing a discussion of the “energy strategy 2050,” which is needed because of the phase-out decision, and on the other hand the issue was still able to draw enough media attention to it and form a peak. If the issue of this study does actually enter into Downs’ (1972) fourth phase, (where public interest declines) is ambivalent. Most citizens might have developed some amount of fatigue to the issue (Luhmann, 1971; Waldherr, 2014), but in the media coverage there are no clear signs of fatigue. First, the amount of coverage does not really decline to an amount where I would argue there is fatigue, and second, regarding the risk dimensions, they are still part of the nuclear energy coverage. On the other hand, clearly the amount of attention to the issue is lower than during the most intense media coverage phase. In that sense, yes, there is a decline of public interest. As mentioned before, the fifth post-problem stage of Downs (1972) does not seem to occur in the time period of this study. The arguments for this consideration are the same as for doubting that Downs’ fourth phase has occurred in this study. It might be the case as Graf (2003) argues, that the issue will disappear first when there is a political solution to the problem. Depending on what one would consider a solution in this case, this point might occur sooner or later. In November 2016, the majority (54.2%) of Swiss citizens voted against the initiative of the Green Party, which would have limited the allowed run time to 45 years. If successful, this would have meant that all nuclear power plants would have to be taken off the grid in 2029. However, it is questionable whether this was an event that could be considered a “solution.” Furthermore, it is an empirical question whether the media focused less on nuclear energy after this referendum. It might well be that the issue remains. Other than that, the energy issue will remain a problem, and climate change will more or less force the energy issue, and perhaps also the nuclear energy issue, to stay on the political and media agenda.

To conclude, the impact of a key event to this phase model shall be discussed. As was discussed by Downs (1972), not all phase transitions are very distinct; they can be subtle, and due to slow transitions. As this study shows, phase transitions can also be very distinct, if caused by an unexpected key event. This was the case as Fukushima triggered, not only a vast amount of coverage, but also a change in the risk dimension focus. Therefore, a key event like Fukushima can definitely become a game changer for

media's risk focus. For phase models, this means distinct phase borders and the beginning of a new phase flow, which might be, but does not have to be a cycle. As mentioned previously, the suggested phase model is consciously not called a cycle, because if the decision would be made not to take any further risk, the issue will most probably not trigger any more risk coverage cycles, regarding that specific risk.

On the other hand, other phase transitions, as discussed, can be due to subtle changes and the transitions are smooth. In some cases, as for example the transition from the third to the fourth phase, as the benefit regain attention, most variables in the coverage stay the same, and some change a bit. Depending on which focus it is that changes, those transitions can be interpreted as a phase transition. The benefit was a subtle change in the amount of attention the dimension regained; on the other hand, however, after an accident like Fukushima, it could be assumed that the benefits would be long out of focus. Therefore, as they regain some attention, this might be considered as a significant change.

Closing with a short answer to the research question, yes, there is a phase pattern to media's risk coverage.

9.8. Risk coverage pattern in the phases

This chapter aims to group together the heterogenic sum of articles into homogenous groups, or clusters, using the structure exploring analysis method of cluster analysis. This analysis will answer the question if there are previously undefined article types that emphasize different sets of risk dimensions, in the different phases. The analysis method used here is the two-step flow cluster analysis in SPSS. For each phase, the risk dimensions, which are mentioned in five or more percent of the articles in the specific phase, are selected and entered into the cluster analysis. Thus, the variable set differs slightly between the phases. This procedure is copied from Matthes and Kohring (2008; see also Nienierza, 2014a), who also omit variables with little variance, because they have no influence on the cluster, and they, as well, omitted variables that occurred in less than five percent of the articles. In addition, Matthes and Kohring (2008) also used different variable sets for different time periods in their long-term frame analysis. Since media coverage evolves over time, this procedure is also applied here. In the following, the cluster solutions will be shown and discussed for each of the four phases.

9.8.1. *Risk coverage pattern in phase one*

In Table 18 the three clusters, produced by the two-step cluster analysis for the phase, reach from January 2010 until just before Fukushima.

Table 18 Cluster analysis phase one

Phase one			
Risk dimension variable	Cluster 1	Cluster 2	Cluster 3 ⁶⁷
Name	Social benefits and upcoming decision	Risk coverage	Environmental detriment and upcoming decision
Cluster size	60% (106)	24% (42)	16% (28)
Decision¹			
Decision to keep nuclear energy	13	26	7
Decision to phase-out nuclear energy	10	9	4
Upcoming decision	18	24	36
Benefit			
Technical benefit		29	
Economic benefit	6	12	
Societal benefit	18	52	
Environment benefit	2	14	
Degree Benefit	5	45	
Probability benefit			
Uncertainty benefit	3	26	
Detriment			
Technical detriment		36	14
Economic detriment		24	4
Societal detriment			
Environment detriment		26	100
Individual detriment	1	5	21
Severity detriment		26	29
Probability detriment		26	4
Uncertainty detriment		48	11

Note. All numbers, except the ones in the parentheses, show the percentage of articles in which the risk dimension was covered. Totals may not equal 100 percent because of rounding off. For better visual presentation, zeros have been omitted.

Two step cluster analysis with Log-Likelihood distance measurement and Bayesian Information Criterion (BIC) Grey highlighted rows were not included in the cluster analysis because the variables occurred in less than five percent of the articles in this phase.

The three most defining variables in each cluster are bolded.

Silhouette Coefficient .4⁶⁸

¹ All three decision dummy variables include all coded geographical locations.

⁶⁷ The automatically generated number of clusters when not restricting to a specific number of clusters are three clusters if integrating all risk component variables over the whole sample period as well as if only including the risk components that over the whole sample period occur in more than 5 percent of the articles. The number of clusters per phase is also three in two of four phases if including all risk component variables in the analysis. Therefore the number of clusters has been fixed to three clusters for all phases.

⁶⁸ The silhouette coefficient can take on values between -1 and 1. Values under 0 predicate that the articles inside the cluster are sometimes more similar to articles in other clusters than to the other articles inside the cluster in which the article is. Silhouette coefficients over 0 show how well articles lie within their clusters (Rousseeuw (1987)).

Cluster one, *social benefits and upcoming decision*, is clearly dominant as it represents 60 percent of the articles published during this time period⁶⁹. This cluster is defined by the discussion of the social benefits of nuclear energy, the upcoming decisions regarding nuclear energy, as well as the decision to keep nuclear energy. However, the low percentages of the risk dimensions defining this cluster, as well as the few risk dimensions included overall, indicate a relatively general nuclear energy coverage, which does not emphasize the risk of the technology. Therefore more than half of the articles published before Fukushima can be seen as engaging quite little with the risk of nuclear energy.

The second and the third clusters are smaller, but defined by broader sets of risk dimensions. The second cluster occurs in 24 percent of the articles and represents a broad discussion of risk dimensions, as almost all risk dimensions are covered in those articles. The strongest defining risk dimensions are social benefits and the degree of benefits, together with the uncertainty about detriments. Paired with the discussion of all entered benefits and risk dimensions, the decision dimensions are strongly represented. Foremost the decision to keep nuclear energy and upcoming decisions are covered. Because of this broad coverage the cluster is given the name *risk coverage*.

The third cluster of the first phase is again smaller, with only 16 percent of the articles falling into this cluster. It is a cluster very clearly defined by the coverage of environmental detriments, as all articles in this cluster discuss this detriment. Further, the severity of detriments is defined in this cluster as well as upcoming decisions. Because of the strong focus on environmental detriments the cluster is given the name *environmental detriment and upcoming decision*.

In sum those three clusters show that most articles before Fukushima did not have much media coverage of the risk of the technology. Recalling that the main topic of 2010 was energy policy and that Swiss and foreign politicians were the most prominent politicians in the neutral coverage, this point to a political discussion that did not have a broad risk focus, as rather covering the beneficial side of the technology. However, risk coverage is not totally absent in this time period. There are articles that do engage in a broad discussion of the risk, covering detriments and benefits as well as the risk decision. In addition, there are few articles that heavily focus on the environmental detriments the technology can cause. The silhouette coefficient of .4 shows that the cluster solution might not be considered very strong. This result supports the coverage of the nuclear

⁶⁹ For the largest cluster in phase one an example article representing the cluster has been included in the Attachment E Tages-Anzeiger (2010c) “Bern und St. Gallen versetzen Atomwirtschaft einen Dämpfer”.

energy issue in general, which is rather homogenous, as the clusters are not very far away from each other.

9.8.2. Risk coverage pattern in phase two

The clusters in the second phase, which is rather short, but intense, reaching from the day of the nuclear accident until the end of April 2011, are more homogenous in size than the clusters of the first phase. However, here there is one cluster that occurs more often than the other two.

Table 19 Cluster analysis phase two

Phase two			
Risk dimension variable	Cluster 1	Cluster 2	Cluster 3
	<i>Accident coverage</i>	<i>Risk coverage</i>	<i>Phase-out</i>
Cluster size	45% (169)	28% (105)	27% (100)
Decision¹			
Decision to keep nuclear energy			
Decision to phase-out nuclear energy	2	9	13
Upcoming decision	1	39	
Benefit			
Technical benefit	1	17	
Economic benefit			
Societal benefit		44	
Environment benefit		17	
Degree Benefit	1	28	
Probability benefit			
Uncertainty benefit			
Detriment			
Technical detriment	59	27	
Economic detriment	20	33	
Societal detriment	25	10	
Environment detriment	21	10	1
Individual detriment	55	6	1
Severity detriment	78	22	
Probability detriment	30	9	
Uncertainty detriment	60	25	

Note. All numbers, except the ones in the parentheses, show the percentage of articles in which the risk dimension was covered. Totals may not equal 100 percent because of rounding off. For better visual presentation, zeros have been omitted.

Two step cluster analysis with Log-Likelihood distance measurement and Bayesian Information Criterion (BIC)

Grey highlighted rows were not included in the cluster analysis because the variables occurred in less than five percent of the articles in this phase.

The three most defining variables in each cluster are bolded.

Silhouette Coefficient .4

¹ All three decision dummy variables include all coded geographical locations.

Cluster one is represented in 45 percent of all articles in the second phase and is clearly defined by articles covering the detriments of the Fukushima accident. The technical detriments are the dominating type of detriments, and the severity, as well as the uncertainty regarding detriments, is well represented in this cluster. This cluster differs from the third cluster in the first phase. The third cluster in the first phase also focused on the detrimental side of the technology, as does the first cluster in the second phase. However, dissimilar from the first cluster in the second phase, the third cluster in the first phase also covered the decision dimensions. Because the focus of the first cluster in the second phase only focuses on the detrimental side of the technology, the cluster is given the name *accident coverage*.

The second and the third cluster are almost equal in size, including 27-28 percent of the articles in this phase. The second cluster is similar to the second cluster in the first phase in that it is defined by a relatively broad coverage of almost all risk dimensions⁷⁰. The strongest focus lays on social benefits and economic detriments as well as upcoming decisions. Because of its broad coverage of benefits, detriments, and the decision, it is similar to the *risk coverage* cluster in the first phase, and is therefore given the same name.

The third cluster is the least defined cluster regarding the risk dimensions. The only risk dimension that defines this cluster is the decision to phase-out, and it is only covered in 13 percent of the articles in this cluster. This coverage can be considered an initial political reaction to the accident in Fukushima, which is triggered by, but disconnected from, the accident coverage covering the event of Fukushima itself. Because of its focus on a nuclear phase-out, the cluster is called *phase-out*. The articles that fall into this cluster are political in their nature, and some show how Swiss politicians, who were in the middle of an electoral campaign (2011 was a parliament election year in Switzerland), issued nuclear energy and integrated the issue into their campaigns⁷¹.

The cluster solution of the second phase can be summarized as a phase in which the actual detriments of the accident were a much bigger focus of the media coverage. However, this part only made up for about every second article in this phase. The other half of the coverage on the one hand showed to be broad risk coverage, considering the beneficial side of the technology as well as the detrimental side, while discussing upcoming decisions. On the other hand about every fourth article seem to be disconnected

⁷⁰ In Attachment E there is an example article representing this cluster Neue Zürcher Zeitung (2011f) “‘Black Swan’ der Energiewirtschaft”.

⁷¹ See example article in Attachment E Tages-Anzeiger (2011e) “Störfall könnte zum Glücksfall für die Grünen werden – und der SP schaden”.

from the accident, covering a phase-out decision, which was most probably triggered by the accident. As for the first phase, the silhouette coefficient of this cluster solution is .4, which again does not show a very strong solution, implying that the clusters are quite close to each other.

9.8.3. *Risk coverage pattern in phase three*

The third phase stretches over the time period of May 2011 until the end of January 2012 and shows three clusters, which again have the same silhouette coefficient, .4, as did the cluster solutions in the two previous phases.

The first cluster in the third phase is the smallest cluster, including 25 percent of all articles during this time period. This cluster is clearly defined by the coverage of a nuclear energy phase-out, as this decision is covered in 80 percent of the articles in this cluster. Also heavily emphasized are the societal benefits, and slightly less emphasized, but still defining for this cluster, is the degree of benefits. With this focus, this cluster is not similar to any of the previously observed clusters. It might seem contradictory that the decision to phase-out nuclear energy is combined with the coverage of benefits of the technology. This might be a sign of journalists aiming to balance their coverage by not only representing one side of the coin. In discussions around a nuclear phase-out, the potentially lost societal benefits, like cheap energy, are relevant, and the degree of the, until now lower, costs and potential increase in costs are discussed. This cluster is therefore given the name *phase-out and benefits*.

The second cluster is the largest in this phase with 43 percent of all articles published during this time period falling into the cluster. The cluster is clearly defined by the discussion of different detriments, their severity, and the uncertainty connected to them. In focus are environmental detriments. Societal benefits, the decision to phase-out nuclear energy, as well as upcoming decisions are each covered in only ten percent of the articles in this cluster. Therefore there is a clear emphasis on the detrimental side of the technology, but compared to the first cluster in the second phase, which was only detriment coverage, this cluster can be considered to be a bit broader in its focus, but not as broad as the two previously observed *risk coverage* clusters. Hence, it is neither accident coverage nor is it clearly risk coverage in the broad sense. Therefore this cluster can be interpreted as merging together the accident coverage occurring in the second phase, which clearly covers the accident in Fukushima only, and the previously seen risk coverage. Also, in this phase, with this cluster solution, this cluster is the closest we get to risk coverage, as neither the first nor the third cluster are risk coverage in the

broad sense defined in this study. Therefore the cluster is given the name *risk coverage with detriment focus*⁷².

Table 20 Cluster analysis phase three

Phase three			
Risk dimension variable	Cluster 1	Cluster 2	Cluster 3
	<i>Phase-out and benefits</i>	<i>Risk coverage with detriment focus</i>	<i>Future decision</i>
Cluster size	25% (128)	43% (220)	32% (163)
Decision¹			
Decision to keep nuclear energy			
Decision to phase-out nuclear energy	80	10	
Upcoming decision	5	10	19
Benefit			
Technical benefit			
Economic benefit			
Societal benefit	31	10	
Environment benefit			
Degree Benefit	19	5	
Probability benefit			
Uncertainty benefit			
Detriment			
Technical detriment	1	44	
Economic detriment	2	28	
Societal detriment		14	
Environment detriment	3	59	
Individual detriment		21	
Severity detriment		56	
Probability detriment		20	
Uncertainty detriment		48	

Note. All numbers, except the ones in the parentheses, show the percentage of articles in which the risk dimension was covered. Totals may not equal 100 percent because of rounding off. For better visual presentation, zeros have been omitted.

Two step cluster analysis with Log-Likelihood distance measurement and Bayesian Information Criterion (BIC)

Grey highlighted rows were not included in the cluster analysis because the variables occurred in less than five percent of the articles in this phase.

The three most defining variables in each cluster are bolded.

Silhouette Coefficient .4

¹ All three decision dummy variables include all coded geographical locations.

The third cluster is the second largest in this phase and is similar to the third cluster in the second phase, which only focused on the phase-out decision. Instead this cluster

⁷² An example article to this cluster is found in Attachment E Tages-Anzeiger (2011q) „Diese Technologie gefährdet die Menschheit“.

focuses only on the upcoming decision. It is again a weak cluster in that the only defining risk dimension occurs in 19 percent of the articles in this cluster. The observed shift of focus on the decision from the second phase is interesting. In the second phase, which was the accident phase, the phase-out decision was the focus of the cluster, which is similarly found in the third phase. However, in the third phase the focus has shifted to the upcoming decision. It might be the case that the immediate reaction to Fukushima was a phase-out decision. This is however going to be confirmed in the close future (in the next years after Fukushima), and therefore the focus shifted to this upcoming decision. The first move in the direction of a phase-out was made, and now the focus instead has turned to the upcoming decision regarding nuclear energy. The third cluster is given the name *future decision*.

9.8.4. Risk coverage pattern in phase four

The fourth phase stretches over the longest time period in this study, from February 2012 until March 2015, and shows two larger clusters that are equally distributed and one smaller cluster. The silhouette coefficient is somewhat lower than in the previous phases, .3, which again points out that the clusters are not very far from each other, which indicates that the articles are not very different from each other. One characterization of this phase is that the decision to keep nuclear energy was again covered in more than five percent of the articles, and was therefore included in the cluster analysis. This was the case in the first phase as well, but not in the second and the third phase.

The first and the largest cluster includes 38 percent of all articles in this phase and is defined only by one risk dimension, namely the decision to phase-out nuclear energy. Thereby the phase-out cluster of the second phase seems to have returned, but this time it is the largest cluster instead of the smallest, and it has a more defined focus on the phase-out decision, as 28 percent of the articles in this cluster address this decision. However, by only being defined by one variable, it is at the same time to be considered the weakest cluster regarding risk dimensions. Because of its focus it is given the name *phase-out*.

The second cluster in this phase is the smallest one. It is defined by a clear focus on environmental and technical detriments, and detriment severity. But all detriment dimensions are more or less in focus in this cluster. In addition to that, 14 percent of those articles at the same time address the decision to keep nuclear energy. Seldom also are the decision to phase-out and upcoming decisions mentioned. Thereby it has some similarities to the third cluster in the first phase, which focused on environmental detriments and upcoming decisions. However, the cluster here is not defined by such a strong focus

on environmental detriments and upcoming decisions. Therefore this cluster is given the name *detriments and weak decision focus*.

Table 21 Cluster analysis phase four

Phase four			
Risk dimension variable	Cluster 1	Cluster 2	Cluster 3
	<i>Phase-out</i>	<i>Detriments and weak decision focus</i>	<i>Risk coverage</i>
Cluster size	38% (287)	26% (196)	37% (283)
Decision¹			
Decision to keep nuclear energy		14	6
Decision to phase-out nuclear energy	28	6	28
Upcoming decision		4	27
Benefit			
Technical benefit			24
Economic benefit			
Societal benefit			47
Environment benefit			
Degree Benefit			36
Probability benefit			
Uncertainty benefit			13
Detriment			
Technical detriment		51	23
Economic detriment		6	49
Societal detriment		18	17
Environment detriment		59	16
Individual detriment		23	3
Severity detriment		47	49
Probability detriment		8	19
Uncertainty detriment		32	33

Note. All numbers, except the ones in the parentheses, show the percentage of articles in which the risk dimension was covered. Totals may not equal 100 percent because of rounding off. For better visual presentation, zeros have been omitted.

Two step cluster analysis with Log-Likelihood distance measurement and Bayesian Information Criterion (BIC)

Grey highlighted rows were not included in the cluster analysis because the variables occurred in less than five percent of the articles in this phase.

The three most defining variables in each cluster are bolded.

Silhouette Coefficient .3

¹ All three decision dummy variables include all coded geographical locations.

The third cluster is the second largest and again, as previously observed, a broad focusing cluster, including all risk dimensions to different degrees. Most defining for the cluster is the focus on economic detriments, severity of detriments, and societal benefits. In addition, the decision to phase-out nuclear energy and other upcoming decisions

are mentioned in about every fourth article. Because of the cluster's broad focus it is again considered to be risk coverage and is also given this name⁷³.

Summarizing the findings regarding the three clusters in the fourth phase shows that there is about an equal amount of articles covering the phasing out of nuclear energy as there are articles that can be defined as risk coverage. There is no cluster with only the benefits in focus, but instead one with the detriments in strong focus. Therefore it seems to be a phase in which the benefits of the technology are mostly covered in combination with the detriments. With the focus on the phase-out decision, it seems to be a phase that is rather negatively biased regarding nuclear energy.

9.9. Interim conclusion – risk coverage pattern in the phases

In order to provide an overview of the clusters in the different phases and to discuss those, the clusters have been included in Table 22, where they are shown across the four phases.

Table 22 Clusters across the phases

	Largest cluster	Second largest cluster	Smallest cluster
Phase one	<i>Social benefits and upcoming decision</i> (60%)	<i>Risk coverage</i> (24%)	<i>Environmental detriment and upcoming decision</i> (16%)
Phase two	<i>Accident coverage</i> (45%)	<i>Risk coverage</i> (28%)	<i>Phase-out</i> (27%)
Phase three	<i>Risk coverage with detriment focus</i> (43%)	<i>Future decision</i> (32%)	<i>Phase-out and benefits</i> (25%)
Phase four	<i>Phase-out</i> (38%)	<i>Risk coverage</i> (37%)	<i>Detriments and weak decision focus</i> (26%)

The cluster in the first phase show a clear division between articles covering the benefits of the technology and an upcoming decision and articles covering detriments of the technology together with an upcoming decision. However, the largest cluster is the one that focuses on the beneficial side of the technology. In the middle there is the cluster, which in a broad manner covers the risk of the technology.

This rather positive stance is abandoned as Fukushima happens. Most articles in the second phase deal with the accident and its detriments, a nuclear phase-out, as well as

⁷³ An example article for this cluster is to be found in Attachment E Neue Zürcher Zeitung (2013) “Wer die wahren Kosten trägt”.

continuing with broad risk coverage. This broad risk coverage disappears in the third phase. Instead there is risk coverage that focuses on the detrimental side of the technology in a stronger manner. A future decision regarding nuclear energy is emphasized together with another cluster defined by the decision to phase-out and at the same time covering the beneficial side of the technology.

In the fourth phase, the risk coverage reappears and is stronger than in all the other phases. The phase-out decision is again in focus, as it was in the second phase. The benefits are mostly covered together with the detriments and the risk decision. The smallest cluster focuses on the detrimental side of nuclear energy together with the decision dimensions.

This analysis shows that the benefits had the strongest focus before Fukushima happened. In the following phases the beneficial side of nuclear energy is either embedded in broad risk coverage, which more or less addresses all risk dimensions, or the benefits are covered together with a phase-out decision. This can be interpreted as if the benefits of the technology lost focus, while the detriments gained focus with Fukushima and then seemed to keep focus. This leads to the conclusion that the key event of Fukushima did change the coverage of nuclear energy regarding the shift from the beneficial side to the detrimental side of nuclear energy. It also indicates that the benefits are however not forgotten, but they are covered together with other risk dimensions than they were before the accident. This result also shows that the clusters that are called risk coverage, because they broadly cover different risk dimensions, are more or less present in all four phases. Except in the third phase, where the risk coverage has a rather detrimental stance. This result indicates that, more or less across the sample, there are articles which can be grouped together, which cover risk in a broad manner.

10. Summary

This study has reviewed several different theoretical risk definitions and their empirical implementation, and combined *risk dimensions* into one risk definition, which understands the concept of risk in a broad way. Thereby:

Risk includes a decision, which comprehends a more or less conscious weighing of potential benefits and detriments against each other, in a more or less uncertain situation depending on the amount of information available on probabilities, degrees, and severities of both the benefits and the detriments.

This definition enables and this study provides an empirical framework for the exploration of the media's risk coverage, allowing study of the coverage in more detail than has previously been done. Additionally, this study has combined this risk dimension analysis with theoretical approaches as to how the media depicts different issues over time and in different phases. This study also relates to the studies that investigate which influences key events have on media coverage. Connecting to a growing, international body of media content analysis on nuclear energy coverage, this study has investigated the risk coverage of two Swiss newspapers, covering the nuclear energy issue, over a time span reaching from 2010 to early 2015. Thereby, this study set out to answer four research questions on how Swiss newspapers cover nuclear energy, how media cover risk, if the nuclear energy accident in Fukushima changed the risk coverage, and if there is a phase pattern to risk coverage. By investigating these research questions, this study attempted to close several gaps in the research. Very little is known about how Swiss media covers the risk of nuclear energy and therefore this study provides new knowledge about Swiss risk coverage. Further, most previous risk coverage studies study only some aspects of the risk concept, and by using a broad risk definition this study set out to give a complete picture of how the media depicts all dimensions that make up the complex structure of risk. By studying a long time span of media coverage, the knowledge on how media on the one hand covers risks in times where there is no detriment drawing attention to it, and on the other hand how a severe accident might change media risk coverage in the long-term, would be extended. By investigating risk coverage in a broad sense over a long time period, this study extends the knowledge of how media deals with risks and how media depicts risks at different times, on the one hand when there is no detriment and on the other hand when there is a detriment and how the media coverage develops after a detriment. Thereby the key strengths of this study are the empirical implementations of a broad risk understanding over a long time span.

This study has demonstrated several new findings, and those will briefly be summarized in this section.

The results of this study show that nuclear energy is an issue, which the two analyzed newspapers cover to, what this study considers, a high extent. Before Fukushima, there were on average 32 articles per month covering nuclear energy in both newspapers together. That means that a reader who reads one of the newspapers every day, would read about nuclear energy every second day. This implies that nuclear energy is an issue, which in general, triggers quite some attention. The explosion of media coverage during Fukushima shows that nuclear accidents trigger vast amounts of media coverage. In 2011, there were on average 152 articles published monthly in the two newspapers together. The accident let media focus on the nuclear energy issue stronger than before the accident for three years, before the amount of coverage returned to somewhat similar extent compared to before the accident. This media coverage generally reports on the issue from a domestic political perspective, as the most commonly discussed topic in the media coverage is domestic energy policy, and the most cited actors are domestic politicians. In times when there is no severe accident, Swiss media coverage of the issue is more or less neutral, but an accident like Fukushima let the negative bias of the media coverage become strong, and long lasting, as it was rather negative throughout the sample of this study. However, most of the time the journalists do not engage in sensational and controversial journalistic presentation. Therefore Swiss newspapers can be considered to cover nuclear energy quite frequently, even at times when the technology does not cause a severe detriment. The issue is dealt with out of a political perspective, and is normally dealt with in a neutral way, except after a severe accident.

Regarding risk, the two newspapers have shown to engage the most in the coverage of the risk decision, the benefits, and the detriment coverage, especially when there have been no accidents in the nuclear power plants. However, when a detriment occurs, the focus changes. Instead the media gives more attention to the detriment, its severity, probability, and uncertainty, than to the coverage of the benefits and the decision dimensions. The risk decision however soon regains media attention, after only some weeks after the accident. It lasts longer until the beneficial side of the technology regains the attention it had before the severe detriment, sometimes several months or almost a year later. The result is somewhat surprising that even in times when there are no detriments, the detrimental side of the technology is covered in similar amounts, as are the benefits and the decision dimensions. Another interesting result is that the newspapers engage the least in the coverage of the benefit probability, compared to the other risk dimensions; only two percent of all analyzed articles address the benefit probability. The benefit that is focused on the most in the media coverage is the benefit “general energy production,” and the most focused detriment is the ionizing radiation, even at times when there is no accident causing radiation fall out.

A factor analysis has shown which risk dimensions often occur in the same articles. When the environmental detriments, which include ionizing radiation, are covered, then other types of detriments, the severity and the uncertainty regarding them, are also covered. This means, the dimensions capturing the detrimental side, with focus on the environment, are often co-occurring. Instead when the media focuses on the technical benefits of the technology, which includes the capacity and the efficiency of the power plant, other benefit types, their degree, probability, and uncertainty, are also focused on. Interestingly, when economical detriments are covered then economical benefits are also discussed to a certain degree. When the decision to keep nuclear energy is covered, then media coverage engages in the discussion of environmental benefits. And when the coverage focuses on upcoming decisions then they to some degree also speak about economical benefits. Hence, the data suggest that the media engages in a broad risk coverage, which can be influenced to strongly focus on, for example, the detriment, when a detriment occurs. Interestingly, when the media covers the decision to keep nuclear energy, then the focus lays on environmental benefits, and when the media covers economical detriments, then they also cover the economical benefits. Hence, in general the energy that nuclear energy plants produce is the most focused benefit, but when it comes to the decision of whether or not to keep nuclear energy, then the environmental impact is the focus.

Regarding the risk phases, this study has extended our knowledge beyond that the media focuses on detriments stronger than benefits in general, and much stronger after accidents, to show that before Fukushima, the Swiss newspaper coverage engaged in a prospective risk deliberation. The focus was on an upcoming decision, benefits and detriments. It was mainly a political media debate, in which nuclear operators were also cited in almost a third of all articles. In this phase, the media did not engage in either a positive or negative bias, but covered the issue neutrally. This shows that the media does write about the benefits of the technology, but at the same time, they also cover the detriment it can cause, and the media does this while at the same time discussing an upcoming decision. This is possibly an indication of balanced media coverage, informing upon the risk in a broad way, without strongly focusing on either the positive or the negative side. Fukushima changed this risk coverage to become detriment coverage. Heavy focus was given to the detrimental side, with its severity, and uncertainty, but only for a short time, not quite two months. The coverage was mainly negatively biased and the main topic was the accident itself. Already this detriment coverage phase, the decision dimension regained the attention it lost during the detriment coverage and the risk coverage became a phase of detriment deliberation. This implies that the detriment and its follow-up dimensions were still strongly emphasized, but at the same time the risk decision was being covered. During this phase the beneficial side of the technology

was not causing a lot of attention. This seems to slowly change about one year after the accident, when the risk coverage entered into a phase of risk reconsideration. The detriment was still much focused upon, as was also the decision, but the beneficial side of the technology regained some of the attention it lost due to Fukushima, and therefore this phase can be considered a phase of reconsideration. The phase of risk reconsideration is not considered to end during the analyzed time period. Therefore it is concluded, that an issue fatigue does not yet occur during the sampled time period and does not yet let the issue enter into the assumed next phase of slumber. During the long time (almost four years) of the reconsideration phase, there might be slight signs of mini-phase models, which would seem to have a similar pattern as the large phase pattern, i.e. real world events, like specific decisions or smaller nuclear incidents allowing either the decision or the detriment dimension to peak slightly. However, this study was not able to show any significant changes that would imply that such mini-phases occur. This does not mean they do not exist, but rather that a qualitative content analysis would be needed to firmly confirm this notion. Other than the hypothesized risk phases and additional defining variables, a multinomial logistic regression was able to add additional knowledge exceeding the findings that were the focus of the hypotheses. This was helpful because the multinomial logistic regression could investigate variables (topics and actors) that differentiated the phases from each other. The phases were compared to the considered most neutral phase, which is the first phase, and all topics and all actor types were entered into the model to see which of these would discriminate phases two, three, and four from the first phase. Other than the obvious result that the accident itself determined the phases after Fukushima compared to the first phase other results were also able to add knowledge about the phase discrimination. Under the stabilization of the independent variables in the model, the data show that the topic of risk and safety distinguish the second and the fourth phase from the first phase. This might imply that even while the benefits, as well as the detriments were focused on before Fukushima, the more general tone of the coverage might not have been as risk and safety focused as the coverage following Fukushima. Another interesting result was that even if the coverage overall has shown to be a political issue, the domestic energy policy topic discriminated the fourth phase from the first phase. The data show that this topic is covered more than twice as much during the fourth phase than the first phase. This strengthens the result that the fourth phase was a phase of risk reconsideration. A further clear distinction is that more than twice as much coverage of science and technology occurred in the third phase compared to the first phase. This might indicate that the detriment deliberation phase also dealt with the scientific side of the issue, which seems important to do after such an accident and before a new risk decision is made. Also in the third phase, there was significantly less coverage of other nuclear accidents compared to

before the accident. This goes against previous studies, which have found a stronger focus of similar events after a key event (Kepplinger, 1988; Kepplinger & Hartung, 1995; Vasterman, 2005). Less focus on climate change or protection discriminates the second and the fourth phase from the first phase. This might imply that this benefit of nuclear energy is not given much focus after a severe accident like Fukushima.

Regarding the actors, there were more citations of energy authorities discriminated for the second and fourth phase compared to the first phase. Surprisingly, civilians were covered less in phases two, three, and four compared to the first phase. One speculation would be that the assumed focus on the directly affected people in Japan was not covered as much as one might initially think. At least not in comparison with the first phase where civilians (in Switzerland) might have been causing more media attention due to the upcoming decision on new nuclear energy plant licenses. It is also interesting that opposing actors of nuclear energy were given less attention in the last three phases, compared to the first phase. This might have to do with the fact that 2010 was a year where the future of nuclear energy was in one way more uncertain and more open than after Fukushima. After Fukushima the focus on a nuclear phase-out has been strong and might have led to less focus on opposing actors compared to before the accident, a phase in which the building licenses were causing discussion and in which it might have been more important for interest groups to push their agendas.

In a cluster analysis, risk coverage articles were, for each phase, grouped to determine typical groups of articles. This analysis showed the interesting result, that in all phases except the third phase, a cluster was found which was interpreted as risk coverage. This implies that more or less all risk dimensions were considered in the articles of this cluster. In the three phases where this kind of cluster was found, it was always the second largest cluster. The cluster solutions further strengthened the phase analysis by showing that the first phase had two clusters where the upcoming decision was combined with once social benefits and the other cluster with environmental detriments. This strengthens the argument that it was a prospective risk deliberation phase. In the second phase, the largest cluster was defined as accident coverage, which corresponds with the phase being a detriment coverage phase. In the third phase, the detriment deliberation phase, risk coverage had a strong detriment. In the fourth phase two equally large clusters, the phase-out cluster and the risk coverage cluster, show that the broad risk coverage together with the third cluster, which had a strong detriment focus but also slightly more focus upon the decision to keep nuclear energy, add to the notion that the risk was being discussed in a broad manner, which can be interpreted as a reconsideration, not only focusing the detriments.

In short, the two analyzed Swiss newspaper cover the issue of nuclear energy to quite some extent and mainly out of a political perspective. The media cover risk in a broad way, considering both benefits and detriments, but also the risk decision. Fukushima was definitely a key event as it did change the risk coverage, as well as the energy policy discussion in Switzerland. The risk coverage analysis can identify different risk phases, in which risk is covered in a broad manner when there is no accident. However, severe accidents change the risk coverage to focus strongly upon the detriments, but soon regain its deliberative nature with the focus on the risk decision. The strong focus on the detrimental side lasts long, but the beneficial side slowly regains some of the attention it lost due to the accident.

11. Discussion and Outlook

This study has set out to investigate risk coverage in mass media and concentrated on Swiss quality press coverage of the nuclear energy issue. Combining theoretical approaches on different phases in media coverage (e.g., Downs 1972) and the influence of events on media coverage (e.g., Brosius & Eps 1995), with risk communication studies, and in specific, studies analyzing the media's nuclear energy coverage, this study has enhanced understanding in those areas, as well as contributed to closing the research gaps that occur when risk coverage studies use narrow risk definitions and concentrate on short-term studies. This chapter will discuss the implications of the here-within made findings and deliberate suggestions for the field of risk coverage studies, and extrapolate what this study's findings might imply for the broader field of risk communication. It will also discuss possible implications for the praxis.

The main focus and the key strength of this study are the broad risk definition, the decomposing of the concept, its empirical realization and operationalization, as well as the long duration of the content analysis. It is the combination of the broad risk understanding and the long-term study that makes this study unique and enables the investigation into how journalists navigate risk contexts. There are several previous studies assessing risk coverage in more narrow ways (i.e., distinguishing benefit from "risk"), there are some long-term risk coverage studies, and there are theoretical papers on how to define risk. However, to the best of my knowledge, there is no study that connects to the in-depth theoretical discussions on what the concept "risk" means, that implements a broad risk understanding in its empirical analysis, or that studies risk coverage in this broad of a term on a long-term basis. By doing this, this study provides new knowledge on how media covers risk in, as this study argues, all its dimensions, going beyond the simplified notion of risk being something solely potentially harmful or the opposite of beneficial. This study has, for example, shown that the risk decision makes out for a large focus in risk coverage, beside the focus on the detrimental and the beneficial sides of the nuclear energy risk. The approach of this study, which combines media coverage phase models and a broad risk understanding, has enabled this study to show, over time, that there are phases to risk coverage of nuclear energy. Because there are phases to risk coverage, this does make the sampling time points of other risk coverage studies crucial, especially if the study only analyzes a short time period. As many studies tend to focus on the coverage shortly before and relatively shortly after a detriment, those will only capture a part of the larger risk coverage picture and thereby might miss out on the risk focus changes, which might have taken place before the detriment and will most certainly take place after the detriment. However, as this study has shown, those phase transitions can happen sooner or later and the phase transitions can be subtle. For studies with

small sample sizes the data will not produce significant changes as fast as if a bigger sample were used. By that subtle phase, transitions might go undiscovered. Therefore, this study recommends future risk coverage studies to consider two things: long-term studies are preferable when investigating risk coverage, if the aim is to detect anything other than the strong detriment focus after detriments. If researching economical reasons restrict a continuous sampling, several different sampling time points are recommended. On the other hand, a dense sample becomes important if wanting to be able to take notice of changing patterns. As it has been seen from data in this study from 2015, which had a small sample of only three months and which analyzed every second article, even this sample, which compared to some studies would be considered quite large, was too small to detect potential underlying significant changes. In short, if studies aim to capture the complexity and multifariousness of risk coverage, long-term studies or several dense studies with as large of a sample as possible, across several years, are recommended. Of course, there are other versions and other aims of risk coverage studies than the here implied and then other sampling strategies might be more useful.

Going more into details on the results of this study regarding the broad empirical analysis of risk, the results imply for the field of risk coverage studies, that there is more to risk than just the beneficial and the detrimental side. The way media focuses upon different risk dimensions changes over time, which makes it interesting to cover longer time periods when analyzing risk coverage. It might seem somewhat trivial to conclude that severe accidents let media focus the detrimental part of a risk more than the beneficial part. Results become sounder when knowing that, as in this case, the beneficial side *and* the detrimental side were focused upon before the accident, and the risk decision takes an important role in risk coverage. The decision dimension even seems so relevant to risk coverage that it only experiences an attention dip of a few weeks during the heaviest detriment coverage phase, just to then regain attention and be a solid part of risk coverage. Another highly interesting result was to see that media does almost not at all cover the probability of nuclear energy benefits. This result, however, would become even more expressive if further studies, on other risks, would explore if the probability of benefits is covered to a larger extent when a risk technology is new and not so well-known. One interesting case would be to study how much media focuses on the benefits and the high or low probability of those benefits occurring when covering personalized medicine—a new promising technology that has not yet caused any severe or known detriments. Hence, the empirical application of this broad risk understanding in combination with phase models does enrich the field of risk communication studies. Not only does this approach produce new knowledge upon how different risk dimensions and different risks are covered by the media at different points in time, it also contributes, very importantly, to the ability to compare studies. If further risk coverage studies

implement the empirical model that this study develops and suggests, then those future studies could directly compare risk coverage of different risks and conduct comparisons across countries and media systems. This present study on nuclear energy risk coverage in Switzerland would be comparable to a nuclear energy risk coverage study in Germany, or the US, or Finland. By that the field would gain solid knowledge if different countries do cover the nuclear energy risk differently. But not only that, imagining studies applying this empirical model to other energy risks like wind power, or natural gas burning, then the field would be able to conclude if media treat these risks differently. Do media, for example, emphasize the benefits of some technological risks, to the cost of others? Or do media cover the detriments, or the probability of detriments to occur, of some risks, to the benefit of other risks? There is a growing body of risk coverage studies and studies analyzing the coverage of technological risks. However, since those studies are different in their empirical realization they are not (easily) comparable to each other. This study argues this deficit to the field can be solved if future studies would use the here suggested empirical model. It is not expelled that the model might need some modifications, and further studies will show what those changes would have to be, but for the time being it seems the here-within developed risk concept could easily be transferred to other media, other geographical contexts, and could be used to study the coverage of other risks. Of course the concrete list of benefits and detriments will be different for different risks, but in general the empirical model will be the same.

For other research agendas within the field risk communication, such as the studies on how stakeholders communicate risks and studies on risk perception, the here suggested risk definition could potentially be useful. If studying the communication of stakeholders, much the same empirical model can be used as it has been used in the present study, by analyzing the different risk dimensions in the risk communication. For risk perception studies the broad risk definition would enable, for example, experimental research to modify the risk dimensions in the stimuli material. For example, stimuli material could be created that strongly focused on high degree, but low probability benefits, compared to high degree, but very uncertain benefits. The imaginable combinations are many: low probability detriment, high probability benefit, etc., and to some degree some risk perception studies already take on this pattern (Slovic, 1987). It is a conceptual and empirical question for researchers in those fields, if the suggested model would produce new knowledge and I invite them to consider if the here suggested model would contribute to their research agendas.

Another new finding this study has made is in regards to whether or not key events change media coverage in the long-term (Rauchenzauner, 2008; Vasterman, 2005). Of course it depends on how long “long-term” is considered to last, but this study would

argue that Fukushima did change media's risk coverage of nuclear energy in the long-term. This study has shown that the benefits, which were discussed to a similar degree as the detriments before Fukushima, are discussed significantly less after Fukushima, in addition to the risk decision. It does not last very long for the risk decision to regain focus—only several weeks—but to regain similar levels of media attention takes longer, several months, and after that the focus on the benefits is not stable, but rather fluctuates. However, the detriment focus changed significantly after Fukushima and stayed significantly higher for a few years after the accident. It shall be emphasized however, that the detrimental side of nuclear energy was discussed also before Fukushima.

There is another finding which goes against previous findings of key events or media hype studies regarding similar incidents or events being more prone to coverage after a key event (Brosius & Eps, 1995; Fishman, 1978; Kepplinger, 1988; Kepplinger & Hartung, 1995; Vasterman, 2005). Neither the descriptive results nor the multinomial logistic regression were able to confirm this particular distinction between phases after Fukushima compared to before the accident. This might indicate that the media might have had the chance to enlarge other similar events and smaller incidents, but they did not do it. This could have been for several reasons. It might be that the Swiss media work differently on this particular point. However, the basic logic of media does not seem to be very different from other European countries' media. One possibility is that the media did enlarge such events and similar incidents; however, this study was not able to capture it and possibly every single article would have had to be analyzed to detect this. Another possibility is that Swiss media might have paid more attention to, for example, the caesium in *Bielersee* 2013, but not as heavily for this study to conclude that Fukushima triggered significantly more coverage of similar events. Potentially previous studies did not analyze such a long time period before the key event to be able to make this comparison. This study shows that similar events were covered as much in 2010 as in 2014. By the comparison to before the accident, the minor peak of coverage of similar events in 2014 might well have caused another interpretation.

There are, however, several results of the present study that confirm previously seen key event effects on media coverage. The most obvious triggered effect was the high media attention to the nuclear energy issue (Brosius & Eps, 1995; Kepplinger, 2011; Rauchenzauner, 2008; Weiß et al., 2014), which would be defined as a media storm (Boydston et al. 2014). The cluster analysis of this study implies that there were different risk narratives to different phases, which can be drawn back to have been triggered by Fukushima (Brosius & Eps, 1995; Elmelund-Præstekær & Wien, 2008; McComas & Shanahan, 1999; Vasterman, 2005). The focus on the nuclear phase-out was surely one effect that Fukushima triggered, and the risk coverage with strong focus on the detrimental side of

the technology was surely also a narrative change that the key event triggered. Journalists focused upon politicians, however, the focus was on them even before the key event. There does however not seem to have been a strong focus upon directly affected people and also not on scientists and experts (Esser, 2011). The changes that the key event triggered, which previous studies have identified and did not happen in this case, might only be a hint that different key events trigger somewhat different effects. To take the approaches further it could be considered to merge the following concepts together and to draw on the societal context to make a clearer distinction possibly only between two concepts from this list: key event; trigger event; media hype; and focusing events. One way of doing this could be to define a key event as an event that not only changes media coverage in certain aspects (e.g., number of articles and narrative change), but also an event that lets an issue enter into the policy cycle. This definition would in Switzerland define Fukushima as a key event. It changed media coverage of the nuclear energy issue and it let the issue enter into the policy cycle in which it is still being worked on. On the other hand, one could define a trigger event as an event that also changes media coverage in certain aspects, but does not let the issue enter into the policy cycle. This would be the case of Fukushima in countries in which the event itself did trigger a large amount of media attention on the accident and possibly also to the issue of nuclear energy, but it was not “strong” enough to trigger a political change, or at least political involvement. By such a model, both key events and trigger events would be considered to have certain effects on media, but only a key event would be considered “strong” enough to also trigger the issue to enter into the policy cycle (Jarren & Donges 2011). This distinction is somewhat different from the distinction made today between key events and focusing events, where the approach of focusing events claim an event to have effects on the political system, but without being influenced by the media attention that is given to the event (Birkland, 1998; Kingdon, 2003; Weiß et al., 2014). It is questionable if those two effects, an event’s effect on policy and media’s event coverage effects on policy, are easily separable. Weiss et al. (2014) argue that Fukushima was rather an focusing event in Germany than it was a key event, because the political decision was made so soon after Fukushima happened that the media could not possibly have “had time” to develop such high pressure and effects on the policy system. It might however not be relevant in terms of how *soon* the political system started dealing with the issue, but rather *that* it does. Political systems are also more or less slow or fast in their acting, because of how they are constructed. Therefore, it seems sensible to remain a bit more flexible regarding the time aspect of when an issue enters into the policy cycle after an event. Common sense will help in estimating if the event triggered an issue to enter the policy cycle. If, for example, the Swiss political system was not to deal with the nuclear energy issue several years after Fukushima, then it might not have

been the accident that triggered the issue to enter the political process. To sum up, this study would suggest further key event, focusing event, trigger event, and media hype studies to consider this division: a key event is an event that triggers certain changes in the media coverage and pushes the issue into the policy cycle (Jarren & Donges 2011), where, as Peters and Hogwood claim (1985), it cannot just self-destruct. On the other hand, a trigger event also changes media coverage of the issue in certain aspects, but the event does not trigger the issue to enter the policy cycle.

The current findings on phase patterns, or issue attention cycles (Downs, 1972), add to the body of literature on those models. By combining the fluctuating media focus of different risk dimensions, this study most generally was able to show that there is a phase pattern to risk coverage. More specifically, it showed that some phase changes are cut very sharply; that is the influence that an unexpected key event can have on phase transitions, while other phase transitions are more subtle and in some cases require broad knowledge, not only of the media coverage itself, but also on the societal and political context in which the issue exists. As Jarren and Donges (2011) discuss in their policy cycle model, the media and the policy agenda are intertwined, and this study would argue that knowledge about what happens on the media agenda, as well as what happens on the policy agenda, can be helpful to make sense out of media coverage phase patterns. Other than that, even if the issue has entered into the policy cycle, and Jarren and Donges (2011) claim that the media only can have direct influence on the issue before the more closed policy process starts, this does not mean the media phase model ends when an issue enters the policy cycle's later phases. Media can, and does in the case of this study, still pay much attention to the issue even as the slow political processing of the problem has only started. At the same time the media coverage can still transition into different phases, also during the political process.

Then how do phase transitions happen? This study has shown two types of phase transitions—very clear cut transitions and more subtle transitions. The sharp cut phase transition that Fukushima produced is a clear example of how real world events can change the course of media's risk coverage. An immediate change in focus can be triggered by such events. The more subtle transitions that Downs (1972) points to occurred in the later phases in this study. For example, the subtle regaining of attention that the benefit experienced between the third and the fourth phase is one such example. Regarding the length of phases, Downs (1972) also remarked that the phases are not prone to have a certain length, much rather that the lengths of the phases can vary. This was seen also in this study, with the shortest phase lasting about six weeks and the longest lasting about three years, if not longer. This also shows that media cannot mainly focus on one event, like Fukushima, for several months. Even if the coverage of the actual accident did last

very long, since the situation in the power plant was uncertain for a long time and new information was provided over a long time course, the very high attention to such an event is not probable to last very long. In contrast to a long lasting political discussion, like the one during the risk reconsideration phase, the media can show a similar pattern with slight fluctuations over several years. Without wanting to go into the discussion of whether or not media is a mirror of the outside world or constructing the picture of the outside world, it can most certainly be concluded that there is an interplay of those two “arenas.” Since media cover news, and the political system produces news, media cover those and is thereby mirroring it, but might well through strong focus influence the political system by raising public awareness of certain issues. Therefore, a phase of media coverage can be longer or shorter depending on which risk dimension and the nature of the dimension, are defined for the phase. If it is a severe detriment that is a one-time event, then the risk coverage will for a rather short time focus on the detriment. If instead the risk dimension is a decision, which is dependent of the particularities of the political context, then the risk coverage phase, defined by a strong decision dimension, can be as long as the political process. If however the media does not fall into fatigue and a slumber before. This however has not seemed to happen for the nuclear energy issue in Switzerland quite yet.

Different phase models have suggested a different number of phases and have given them different names, some of which are very similar. As previously mentioned, since this study covers a key event, which immediately has a very strong focus, the second phase seen in several phase models (Downs 1972, Kolb 2005, Eisner et al. 2003) implies an “upswing” or slow rise of attention to an issue, and cannot be confirmed in this study. There is no upswing, no slow, nor steep, increasing curve of attention. The key event causes an immediate peak and culmination (Eisner et al. 2003), which almost cannot get any higher, and therefore is prone to decrease after that distinct peak. Fukushima entered all sections of the studied newspapers, the domestic policy part, the foreign news part, the economy section, the science section, and in a very few cases, the sports section as well. Therefore, the phase model of this study inserts a new phase, which is defined by immediate attention rise, after the first pre-problem or latency phases of previous studies (Downs 1972, Eisner et al. 2003). Other than the insertion of this particular phase after most phase models’ first phase, this study can more or less confirm the general pattern foremost of the phase models of Downs (1972), Kolb (2005), and Eisner et al. (2003). This study specifically concentrates on the risk attention phase model, but the phase names are different from the names of previously mentioned studies. Therefore, the phase names rather give information on the content of the phases than on the amount of attention the issue gets in general. If the phase pattern is the same for other risks, it will have to be investigated in further studies. It is however probable

that if a severe detriment is included in future phase models, then the pattern might very well be similar to the one found by this study. Before anything detrimental happens and while discussing the future risk decisions, a *prospective risk deliberation* can be identified. The society in general is harnessing benefits and discussing the risk in a broad way. There is a seemingly even-handed and balanced risk deliberation, which ended with Fukushima. As soon as something severe like Fukushima happened, the focus of risk coverage shifted and the rather short phase of *detriment coverage* informed about the event and its severity. The severe accident triggered a change in media focus, letting the media engage in mainly detriment coverage for some weeks, but soon the focus shifted slightly, when the decision regained some of the attention it lost during the detriment coverage phase. In the *detriment deliberation* phase the detriment is assessed and it is discussed if the fact of this event should lead to a new risk decision. A new risk decision, re-evaluated in the *risk reconsideration phase*, in which the beneficial side slowly regained some of the lost attention, still produces some fluctuation. This fluctuation could be analyzed in more detail with the aim to detect if those fluctuations are maybe mini-phases. For this study, those fluctuations are rather considered to be characteristic for the reconsideration phase. This phase seems to be a discussion containing a mixture of the still stronger focus on the detriments, but also a consideration of the benefits, and how to deal with this complex situation where a new decision has to be taken and when wanting and needing the beneficial side of a technology, but not being able, for different reasons, to carry the potentially severe detriments. This shows the complexity of the risk societies (Beck, 1986) we live in, in which risks are lurking everywhere and there does not seem to be a way to turn away from one risk without facing another. If nuclear energy is phased out, the benefits of the electricity—namely that it is relatively clean, cheap, and crucial in times of climate change mitigation—disappear and force societies that still require the same or larger amounts of electricity to turn to other, sometimes riskier technologies. Those other technological risks can be detrimental in other ways, such as the burning of coal that causes high CO₂ emissions to produce the necessary energy. Wind energy will not cause such fatal detriments, but rather superficial ones like influencing the beauty of landscapes while not producing such high amounts of energy, and when the wind plant produces too much energy there is not developed technology to store the overflow. The lower degree of benefits combined with the lower severity of detriments, has only in few countries led to investments in those technological risks. Regarding wind energy, Denmark is a country that has invested a lot in the technology. The uncertainty regarding those technologies, their benefits and their detriments, the sparse knowledge of the probabilities of benefits outweighing the investment, and the uncertainty regarding how probable a devastating severity is, makes risks highly complex. However, societies *have* to deal with these risks on dif-

ferent levels. Therefore, the discussion of those risks, which is depicted by the media, is a highly interesting field that can provide crucial information, not only for science, but also for the praxis.

One consideration to make regarding the praxis and policy is: if there are phases to risk coverage, in which different risk dimensions are emphasized and potentially influence media recipients, what does this mean for the point in time at which a risk decision is taken? Remembering the referendum in Bern in February 2011: the majority were giving a new nuclear power plant in *Mühleberg* an OK. If asking the same question to a population that lives very close to a nuclear power plant—the topic of which had already triggered negative headlines even *before* Fukushima—one month later, as newspapers at times had over 30 articles covering the Fukushima accident and its impacts on people, the nature, and economy, what would the outcome of this referendum have been? This study can only speculate around this, but nevertheless the question seems highly relevant to ask: when do we decide upon risks? Which risk dimensions are in focus at that time? In the 1950s when nuclear energy was new and impossibly could have caused any nuclear power plant accidents due to its newness, and even if the potential detriment might have been known to some, most people were excited about the energy this technology could produce, and societies decided to invest in it. The risk was taken. After Chernobyl, Italy for example reconsidered the risk the country had taken decades ago, and decided not to engage in the risk any longer, and instead struggled with high energy prices. Austria invested in the technology and built one nuclear reactor, but the starting of it was voted down in 1978, so the finished reactor was never used. Germany decided on a nuclear phase-out shortly after Fukushima, and might now realize the effect of this decision, and the outcome it will have on, for example, rising energy prices. Switzerland, also very soon after the accident, took two steps away from the technology, but the last word has not yet been spoken on the future of nuclear energy in Switzerland. If citizens are to be involved in this decision, the future will tell. Seeing the development of the risk coverage in Swiss media, the timing of this eventual decision seems crucial. If Swiss citizens would have voted in a referendum during the detriment deliberation phase, within one year after Fukushima, the decision might well be different than if the referendum were held in a couple of years after the accident. The fatigue and slumber phase does not yet seem to have set in and there is no way to tell if, and if yes, when it will occur. It is also not possible to know how a future decision would play out. Public opinion polls of course give useful hints in which direction it could go. It is interesting to imagine the highly improbable case of a referendum date to be set a few years from now, which could mean the decision falls out in favor of nuclear energy, but then a minor or severe nuclear accident may happen just before the referendum, which would likely influence the outcome. Those are only speculations of imagi-

nary cases, but they are to emphasize the potential impact and the meaning of risk attention phases to risk decisions. Those implications have meaning both to nuclear favoring and opposing actors and to politicians who can influence the point in time at which the decision is taken. Those complex interplays of different interests and actors are brought to us by the mass media. This is why this study suggests that risk coverage research is a field that constantly requires research. Risk coverage dynamic is changing over time, and the real world context is changing as well. The risk coverage studies can provide assessments of which risk phase a particular risk exists and give clues into the direction it might develop, if nothing unexpected or severely detrimental happens.

Another pressing question is, do citizens receive medias' nuclear energy coverage, and does it influence their risk perception? The previously mentioned co-authored study of Kristiansen and Bonfadelli (2014) as well as the study Kristiansen and Bonfadelli (2013) were able to show that Swiss citizens gave substantial attention to Swiss medias' nuclear energy coverage. Swiss citizens also reported high media influence on their own opinion in the years 2012 and 2013. Importantly, Swiss citizens mainly inform themselves on nuclear energy by reading newspapers. Following that, the next main information source comes from television. Hence, there is a large interest of Swiss citizens in the issue and since they mainly inform themselves about the issue in the newspapers, the risk coverage of Swiss newspapers can be assumed to be perceived by the recipients. Consequently, it seems probable that this risk coverage at least serves as an orientation to the readers, but might also, as they themselves also claim, have an influence on their risk perception and opinion. One co-authored study (Kristiansen, Bonfadelli, & Kovic, 2016), has in three representative surveys (2012, 2013, and 2014) shown that Swiss citizens' nuclear energy opinion is mainly influenced by the risk perception if the benefits of nuclear energy outweighs its potential detriments. Taking this a step further would imply that if media does not cover the benefits heavily (or if it cover detriments a lot), the benefits will be less perceived, and in the following the benefits of the technology might not be considered to outweigh its potential detriment, and then the opinion of Swiss citizens is more prone to be negative regarding nuclear energy. Depending then on where in the risk attention phase model we are, a decision might fall out in a different way as it would have if the media coverage would have been different. Due to this, risk coverage research does not only contribute knowledge about how the media cover risk, but might also give hints on how citizens perceive the risks.

The outlook of this study wants to encourage others to use the present risk attention phase model to study other risks, in other contexts, and in other media. As mentioned previously, this could produce a body of research that will help us understand how

media navigate different risks, in different countries, and which effects this might have on societies, risk perception, and on risk decisions.

For studies that do not aim to explore risk in such a broad manner, it should still be encouraged to consciously consider what “risk” means, and to look beyond definitions that claim it as a potential harm. Most anyone would agree that we would never take risks if they are meant only to be potentially harmful. Therefore, it is also problematic to analyze benefits versus “risk,” because benefits are a part of risk. By compartmentalizing the risk concept into smaller, measurable parts, we can learn much more about risk coverage than we know today.

The limitations of this study lay mainly in the sample size and sampling methods, as well as in the low intercoder reliability of the actors’ arguments. Regarding the sample size, as this study mention a few times, the sample for 2015 was rather small in order to produce results which could be interpreted. Of course several months in this study had small sample sizes because not many articles were published. A solution to this, which would have produced more easily interpretable results for some time point, would have been to analyze every single article, and not just every second. This was not done in this study because the aim was to analyze at least one year before Fukushima, and then as far as was possible (March 2015) as the coding had to end. In addition to the aim of a longer analyzed time period research economic questions were restricting this study to analyze every article. Further the sample size would have benefitted of analyzing also shorter article. It might be the case that shorter news features were published before Fukushima and long after the accident. This sampling method would also have boosted the sample size somewhat.

Another limitation was that the actors’ arguments did not reach high enough intercoder reliability. The problem was probably not a too-short coder training, as all other variables resulted in acceptable to very good Lotus values. Rather, it seems difficult to extract a bias from, as some might have been, short statements. Because of those low values, those variables were excluded from this study.

Given the Swiss context of this study, a further limitation is that it only studied German language media because of research economic reasons. A study of more newspapers and other media would have cost more time; such a long period of time and dense sampling of articles would not have been possible. Naturally, the question arises whether or not the results of this study hold true in other contexts. From what is known about the Italian and French speaking regions of Switzerland in terms of the risk perception of the population living there, some tentative conclusions can be made.

The population of Tessin, the Italian speaking part of Switzerland, have less trust in the Swiss nuclear power plants than the German and French speaking parts (Kristiansen & Bonfadelli, 2013). As Kristiansen and Bonfadelli (2013) discuss, this might have to do with the fact that Tessin is close to Italy, a country without nuclear energy, whereas the French part of Switzerland might be influenced by France, a country with many more nuclear power plants than Switzerland. The fact that all Swiss nuclear power plants are located in the German speaking part might be part of the explanation of why the German and the French speaking regions are more similar to each other. Therefore, there might well be differences in the way the media in Tessin, but also the French speaking part, cover nuclear energy. Whether they do remains an empirical question and it is certainly a question that future studies would have to answer; the results would be highly interesting. It would also be an interesting case to further test the risk attention phase model and to explore whether there are differently defined phases in the other two language regions. Extrapolating from the risk perception study (Kristiansen & Bonfadelli, 2013) and the results of this study, one speculation would be that the phases look somewhat different in Tessin. It might be that the phase before Fukushima had a stronger negative bias than what was found in the German speaking part. It might also well be that the accident phase had a longer duration and that the beneficial side of nuclear energy took longer to reoccur. Following these tentative thoughts, it might well be that the reconsideration phase never occurred, or occurred later than in the German speaking part. The French speaking part might have even more positive media coverage than the German speaking part, given that France as a neighbour is more positive towards nuclear energy than Germany is, especially after Fukushima. Therefore, the beneficial side of the nuclear energy risk might remain in stronger focus than in the Swiss German speaking press. However, it should be stressed that these are questions that need to be answered with empirical data.

Regarding countries other than Switzerland, it is similarly difficult to say if the results are generalizable. Given the very different political climate towards nuclear energy in other countries and the highly different dependency on nuclear energy, I doubt that the results would be highly similar. However, most probably the peak in the amount of coverage triggered by Fukushima is likely to be more or less distinct in other countries. Whether the bias changes as clearly as it did in this study, or whether the phases take similar patterns is questionable. Just to mention one example, Finland, a country which continues to invest in nuclear energy even after Fukushima, it is difficult to imagine that the media would have reported as negatively on nuclear energy as did the German speaking press in Switzerland. Studies that are conducted in the same way as this are needed to answer these questions. However, what is highly probable is that the multidimensional risk model can be used for other contexts as well and that it will work well to

identify risk coverage phase patterns. These patterns are, however, probably somewhat different from the pattern found in the German language Swiss press.

To summarize, the key strengths and the key contributions of this study have been to connect to the theoretical definitions of risk, thereby developing a broad risk understanding which is able to capture risk in all of its aspects. This definition was empirically implemented by a decomposing of the risk concept and to make those measurable in media coverage. This theoretical and empirical model has been tested on the nuclear energy risk in Swiss media coverage over the time of a little over five years. Thereby, several research gaps have been served. First, there are no studies, to my knowledge, which investigate risk in such detail over such a long time span. The conscious and precise definition of the risk concept and its empirical implementation seems to have produced new knowledge as to how media cover risk. By combining this with key event and phase model approaches, this study has been able to show that risk coverage forms a risk attention phase pattern. The risk attention phase model has to be verified in future studies, but it holds promising solutions to some of the field's struggles, for example the disadvantage of not being able to compare different risk coverage studies with each other. Secondly, there are not many studies analyzing Swiss risk coverage; by performing this study, relevant knowledge about this particular media system has been won. This concept promises a new direction to risk coverage research, which in some years might produce very relevant knowledge as to how media cover different risks, at different times and in different societal contexts.

12. References

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13. Attachment

The attachments to this monograph are available online at the following URL:

<http://nbn-resolving.de/urn:nbn:de:gbv:ilm1-2017100036> [01.06.2017].

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In today's risk-filled society, it is vital to recognize not only the risks that we face every day, but also that knowledge of such risks spreads, above all, via mass media. Risk-related information contributes to our knowledge and affects how we perceive risks and what risk decisions we ultimately make. Among the most memorable disasters of risks taken in recent memory, the nuclear energy accident in Fukushima, Japan, in 2011 changed how the public, policymakers, and media outlets perceive and deliberate the risk of nuclear energy. In response, the research question of this study interrogates how media portrayed the risk of nuclear energy and how coverage of the technology changed after the accident at Fukushima. The study concentrates on how two Swiss newspapers covered nuclear energy between 2010 and early 2015. By using a broad definition of risk and an innovative empirical operationalization of the concept, the study identifies different risk attention phases in media coverage, each characterized by different focus on risk dimensions. Interestingly, results show that those media paid considerable attention to political decisions about the use of nuclear energy, and surprisingly, the detrimental dimension of risk was in focus even before the 2011 nuclear accident in Japan. Although the benefits of nuclear technology became obscured after Fukushima, they recuperated interest as early as a year later. Such results raise a question regarding risk decisions and the use of nuclear energy—namely, when do societies decide upon risks, and how do media portray the risk at that moment in time?

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